MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

NAVAL POSTGRADUATE SCHOOL
Monterey, California

THESIS

AN ANALYSIS OF THE EFFECTIVENESS EVALUATION PROCESS
FOR VP ANTISUBMARINE WARFARE FLEET REPLACEMENT
SQUADRON AIRCREW TRAINING

by

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October 1982

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83   02   028   101

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER	2. GOVT ACCESSION NO. AD-A125 012	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) An Analysis of the Effectiveness Evaluation Process for VP Antisubmarine Warfare Fleet Replacement Squadron Aircrew Training		5. TYPE OF REPORT & PERIOD COVERED Master's Thesis October, 1982
		6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) Bruce W. Crawford		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS Naval Postgraduate School Monterey, California 93940		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS Naval Postgraduate School Monterey, California 93940		12. REPORT DATE October, 1982
		13. NUMBER OF PAGES 117
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)		15. SECURITY CLASS. (of this report)
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Instructional systems development, P-3 fleet replacement squadron training, Aircrew training, Systems approach, Instructional design, Instructional evaluation, Training quality control, Instructional design techniques, External evaluation, Sommative evaluation.

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)
During January 1979 VP-31, the West Cost P-3 Fleet Replacement Squadron, implemented an Instructional System Development based training program. Due to monetary, manpower, and time constraints, the evaluation phase of the new training program was not completely developed or implemented. This thesis examines the current status of the external evaluation portion of the new training program in an attempt to determine the feasibility of its completion and implementation. The external evaluation plan is related to the Interservice Procedures for Instructional System Development Model. From this analysis, a

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better understanding of the plan is gained and recommendations for an improved external evaluation program and training system are presented.

ABSTRACT

During January 1979 VP-31, the West Coast P-3 Fleet Replacement Squadron, implemented an Instructional System Development based training program to replace their traditional training program. Due to monetary, manpower, and time constraints, the evaluation phase of the new training program was not completely developed or implemented. This thesis examines the current status of the external evaluation portion of the new training program in an attempt to determine the feasibility of its completion and implementation. The external evaluation plan is related to the Interservice Procedures for Instructional System Development Model. From this analysis, a better understanding of the plan is gained and recommendations for an improved external evaluation program and training system are presented.

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I. INTRODUCTION

During the last few decades, concentrated efforts have been directed toward improving the design of Navy training programs. One of the most significant achievements evolving from exhaustive research conducted in management sciences, communication sciences, and behavioral sciences has been the application of systematic procedures to instructional system design. The Navy began applying the systematic process to the design of training programs in the late 1950's. Continued refinement of the initially crude systematic procedures eventually led to the modern day state-of-the-art "systems approach" methodology for design of training systems.

The systems approach as utilized in instructional design is a process of planning instruction which makes use of research and learning theory and employs empirical testing data as a means for the improvement of the designed instruction [Ref. 1]. Systems approach technology was the impetus for the Instructional Systems Development (ISD) program which is the approach now required by the Navy, Air Force, Army, and Marines for instructional system design. Instructional systems development is a systematic planning and development process which is designed to optimize training effectiveness and efficiency. Theoretically it seems to be a far better method to design training programs

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than methods previously employed. This is especially true in the area of quality control, because unlike traditional design methods, the ISD approach places tools within a training system to identify and evaluate its design errors. This procedure is especially important when the system is large and the training complex.

Since January of 1979, Patrol Squadron Thirty-one (VP-31), which is the Navy's West Coast P-3 Orion Fleet Replacement Squadron (FRS), has been utilizing the ISD process to train flight crews for the P-3 aircraft. This process was also adopted by Patrol Squadron Thirty (VP-30), the East Coast FRS in January of 1980. Development of the P-3 Instructional System, the VP FRS version of the ISD was accomplished over several years by a large number of Navy and contractor personnel. The system consists of a series of orderly, logical, and interrelated steps to produce a training course which is efficient and effective in providing graduates with the skills, knowledge, and attitudes essential to the performance of a job [Ref. 2].

Since the introduction of the P-3 Instructional System in 1979, the quality control phase has never been formally implemented due to monetary and manpower constraints. These undesirable limitations are common to many situations in times of economic uncertainty. The loss of an active evaluation phase changes the structure of the system from an

ISD process to an extremely sophisticated and rigidly structured training program with no means available for rigorous evaluation of the system. Therefore, even though the system may be well designed and expertly managed, there is no feasible way to determine whether or not the instructional system objectives and required fleet performance levels are being met. The purpose of this thesis is to examine the status of the designed quality control program and provide recommendations for its completion and incorporation. As a result of this examination, an improved P-3 FRS training system should be realized.

A. BACKGROUND

Prior to the implementation of ISD training procedures, VP fleet replacement squadrons utilized traditional training methods and media, consisting primarily of the group-paced lecture/demonstration concepts. These concepts, unlike ISD, offered no affordable means, of locating training design errors, to ensure the existance of an optimal instructional system. This section will discuss the traditional VP FRS training program pointing out some of the serious shortcomings that led to the need for a more sophisticated systems oriented training process. A brief overview of ISD will then be presented, to demonstrate how most traditional

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training system problems can be solved by using the closed-loop "systems approach" for training system design.

1. <u>The VP Fleet Replacement Squadron Traditional Training Program</u>

The traditional training system used by the VP Fleet Replacement Squadrons until the late 1970's, was well designed and skillfully administered. However, inherent in the design methods of the program was the problem of measuring training effectiveness. Training managers were at best able to make only broad assessments of the activities' training value, and their methods were not systematic, comprehensive, objective, nor scientifically accurate. Therefore this type of evaluation proved to be of no particular value to either training personnel or command level managers [Ref. 3].

Evaluation of a training program is a critical concept needed to determine if the objectives of the program and needs of the organization are being met. Also, it must determine if the program is in fact providing the necessary information for graduates to do their job. Evaluation overrides the human error inevitable in the application of subjective opinion in providing a means for training activity personnel to apraise themselves, their practices and products. The evaluation must be specific, continuous,

cooperative, conducted in terms of purposes, and based on objective methods and standards [Ref. 3].

Recognizing the need to determine his training activities' effectiveness and efficiency, the commanding officer of Patrol Squadron Thirty-one requested assistance from the Naval Training Device Center (NTDC) in September 1971. The Naval Training Device Center designed an evaluation program encompassing the total training function of the FRS. The program was modeled after similiar studies of other naval aviation training programs. The results of the evaluation, known as the "VP-31 Educational Self-Audit" sought to determine the quality of specific aspects of the VP-31 training program and to encourage the training staff and faculties to develop improved instructional systems and materials.

The evaluation program, based upon systematic and detailed procedure, was divided into six related segments; (1) Philosophy and Goals, (2) Buildings and Facilities, (3) Management, (4) Staff and Faculty, (5) Curriculum, and (6) Instructional Support. The extensive analysis of each segment identified several basic training discrepancies within the FRS program. The evaluation team concluded that the most important problems would be corrected and training at VP-31 would be significantly improved if the following changes were made: (1) Provide professional educational

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assistance on a full-time basis, (2) provide more complete dialogue among all levels of the Air Antisubmarine Warfare (AASW) community, (3) improve overall instructional skills of instructors and instructor supervisors, (4) implement a program leading to increased use of self-instructional materials and media, (5) establish revision procedures to stabilize the curriculum, (6) decrease the rate of instructor turn-over, and (7) establish better communication between VP-31 and all segments of the AASW community.

The above problems, found by the NTDC team, coupled with numerous other shortcomings such as no clearly written statements of philosophy and goals, no statement of management objectives, etc., led to the general conclusion that a better training system was needed at VP-31. This decision was strongly reinforced in 1974 when it became apparent that the traditional training program could not possibly handle the upcoming incorporation of the 2F87F flight simulator or withstand a proposed twenty-three percent reduction in aircraft and manpower. The Commanding Officer, Patrol Squadron Thirty-one [Ref. 4] in submitting a proposal for instructional development of P-3 FRS training stated:

"... This effort will require the complete restructuring of the present training program both in concept and format. A revision of such magnitude requires a formal development program. Unfortunately, major development efforts in the past employed non-scientific methods and resulted in a R/S (Readiness Squadron) training program of questionable efficiency which left the R/S extremely vulnerable to reductions during periods of fiscal/personnel austerity.

If the new R/S training program is to teach the knowledge and skills essential for successful fleet performance and be supportable on the basis of cost-effectiveness, the process by which it is developed must include the deliberate, orderly methods of a systems approach to training."

This was the first step toward application of ISD methods for training system development within the VP community.

2. Instructional Systems Development

The Random House Dictionary defines instruction as the art or practice of furnishing knowledge, especially by a systematic method. More specifically, it is a set of events employed by those whose purpose it is to develop an organized plan to facilitate learning. Instruction then, simply stated, is a means to help people learn.

Instruction is often applied to an area as an organized way of accomplishing certain goals. This area of interest in the most general terms has no fixed boundaries and is often referred to as a system. System is a relative term and can be thought of as composites made up of interacting constituent parts [Ref. 5]. From these two ideas emerges the term instructional system, whose purpose can be thought of as furnishing a means to satisfy specified objectives to reach any outcome required by a learning program. According to AFM-50 [Ref. 6], the Air Force manual for instructional system development, an instructional system can be thought of as an integrated combination of resources

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(students, instructors, materials, equipment, and facilities), techniques, and procedures performing efficiently the functions required to achieve specified learning objectives. For the purpose of this discussion, an instructional system will be considered a device for attaining whatever learned outcomes a training program intends.

Instructional design can be a very complex and time-consuming process. The fact that there are numerous ways to approach this seemingly impossible task only serves to complicate matters. Gagne' and Briggs [Ref. 1], two pioneers in learning concepts and instructional design, present one method of design that they consider feasible and worthwhile. The process they describe is based upon the following five important assumptions. First, the design must be aimed at aiding the learning of the individual. Although learners are often assembled into groups, learning occurs within each member of a group. Second, instructional design contains both immediate and long-range phases. The instructor preparing lesson plans several hours before a presentation constitutes the immediate phase, while the long-range considerations may consist of a set of lessons covering a topic and a set of topics covering a course. The third assumption is the belief that systematically designed instruction can greatly affect individual human development.

This "guiding light" concept ensures that all students are given an equal opportunity to use their individual talents to the fullest degree. The fourth idea specifically states that the design of instruction should be conducted by means of a systems approach. This idea will be discussed further in the latter part of this section. The fifth and one of the most important points is that when designing instruction, one must take into account how human beings learn in every phase of design.

The aspects of learning theory which have a direct impact on instruction are those which relate to controllable events and conditions [Ref. 1]. Continued research in the area of human learning has brought to light more sophisticated theories than were previously held. It is now known that two categories of factors exist in a learning situation. First are the age-old factors contiguity, repetition, and reinforcement that exist in an individual's external environment. The second and newest category of factors are internal in nature. That is, they originate in an individual's memory. Some of the most important internal factors are: factual information, intellectual skills, strategies, motivation, and an attitude of confidence. These new state-of-the-art concepts depicted in Figure 1.1 emphasizes the fact that, in the design of instruction, both the external situation stimulating the learner and those

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capabilities which learners bring with them must be
considered [Ref. 1].

EXTERNAL FACTORS
Contiguity (Temporal arrangement of conditions)
Repetition
Reinforcement (Arrangement of contingencies)

LEARNING EVENT

INTERNAL FACTORS
Factual Information (May be presented or recalled from prior learning)
Intellectual Skills (Recalled from prior learning)
Strategies (Cued or self-activated, from prior practice)
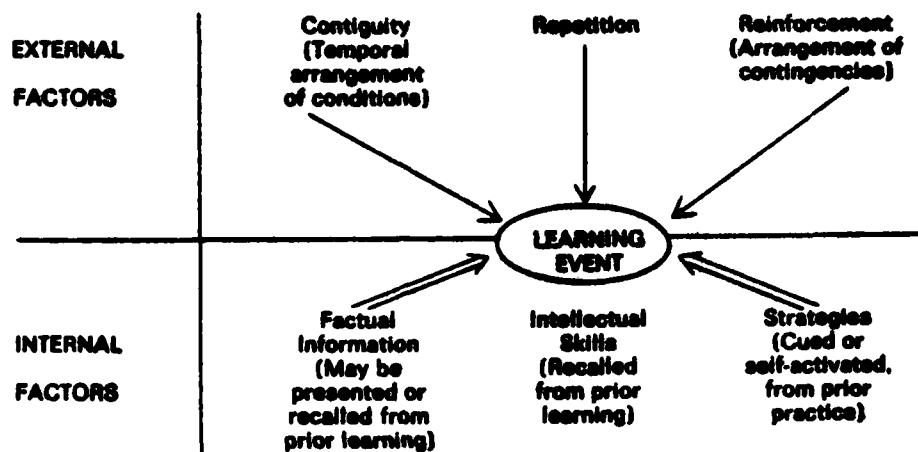
Source: Ref. 1: p. 10
Figure 1.1. Factors Affecting the Learning Event

As stated earlier in the Gagne' and Briggs' design
model assumptions, instructional design should be constructed
by means of a systems approach. This revolutionary concept
has proven to be an invaluable tool capable of incorporating
the high technology innovations developed during the last two
decades into a cohesive plan for the improvement of training
effectiveness and efficiency. Rapid development in the area
of educational technology produced such items as programmed
instruction, the proficiency test, and computer assisted
instruction in such a short timeframe, that attempts to
effectively and economically incorporate all of these ideas
into any sort of an instructional program was impossible.
With the timely development of the systems approach, it

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became possible to incorporate these innovative possibilities into workable educational plans [Ref. 5].

While systematic problem solving is fairly old, it was not until after the Second World War that such concepts began being used in the field of education. Following the War, individuals who had successfully applied the systems approach to the design and implementation of complex military equipment returned to the field of education and began using this new technique to design instructional systems.

The systems approach is a method for constructing a plan that has the capability to design, implement, and evaluate a program that has been constructed to achieve certain goals. Gagne' and Briggs [Ref. 1] give the following description of the systems approach as utilized in their instructional design plan.

"...The systems approach to instructional design involves the carrying out of a number of steps beginning with an analysis of needs and goals, and ending with an evaluated system of instruction which demonstrably succeeds in meeting accepted goals. Decisions in each of the individual steps are based upon empirical evidence, to the extent that such evidence allows. Each step leads to decisions which become 'inputs' to the next step, so that the whole process is as solidly based as is possible within the limits of human reason. Furthermore each step is checked against evidence that is 'fed back' from subsequent steps to provide an indication of the validity of the system."

In practice, the systems approach provides an orderly and logical way of reaching pre-set goals. It is not a difficult concept in theory, but actually applying the approach to

improve the operation and success of a system can prove to be both time consuming and complex. Effective utilization of the concept requires an individual with a solid understanding of the method and an enormous amount of past experience in the design of each phase. Two reasons for the limited success of the systems approach in the area of training in the past are: first, the instructional field is vastly more complex than any area where the concept has been used in the past, and second, few training system designers have a reasonable grasp of the approach. The complexity of the system becomes readily apparent if one considers all of the alternate solutions available at each step of the process and identification of the possible effects of each one. This complexity should not discourage usage of the system. Once the concepts are mastered and enough practice has been obtained in this method of instructional design, it is by far the most effective tool we have available today to design programs to enhance human learning.

Klaus [Ref. 5] states that most designers of instructional systems agree on the following six steps as the principle characteristics of a systems approach to instructional design: (1) recognition and definition of the problem in terms of the desired outcome of any system action, (2) establishment of the criteria to be used in assessing the success of a change, (3) identification of potential

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solutions to the problem, (4) feasibility testing for each promising solution, (5) begin assembling the new system adopting one or more of the solutions, and (6) provide procedures for improving the system as experience is gained and limitations or short falls are discovered. This closed-loop systems approach is illustrated in Figure 1.2. Note the closed-loop and continuous cycle of the system. The dashed arrow represents the ability of the system to insert a discovered problem into the loop to institute an improvement cycle. The system continually corrects itself everytime a problem is discovered. Thus, in theory, the longer a system is in operation the better it will become. Although there are several slightly varying concepts of what constitutes a systems approach, this is one of the most highly reguarded.
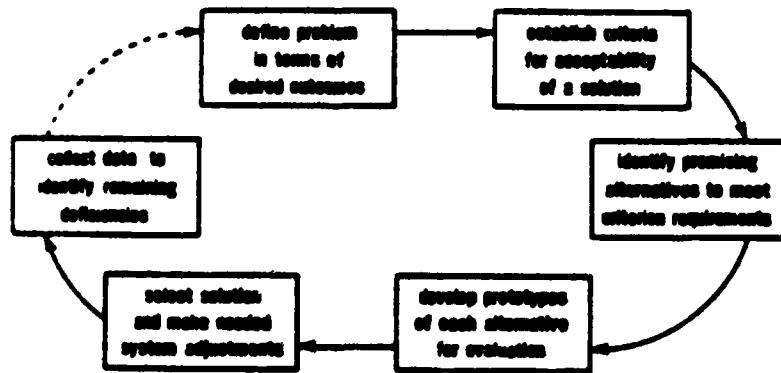
Source: Ref.5: p. 179
Figure 1.2. Steps in the Systems Approach Cycle

The Armed Services began full-scale utilization of the systems approach to training around 1970, when the Air

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Force adopted a training development concept called Instructional Systems Development (ISD). The ISD process is a broad application of the systems approach to training which by design increases the quality of training and reduces the amount of time and money necessary to train an individual. A common misconception that should be corrected from the beginning is the fact that ISD is a process through which training alternatives are selected, and should not be confused with or put on the same level as tools of contemporary training technology, such as slide-tape presentations, programmed instruction, computer assisted instruction, etc. Instructional Systems Development, in a broad sense, is a process which allows for the orderly development or change of training programs and ensures cost-effective instruction that produces graduates capable of acceptable performance on the job [Ref. 6]. Since it is an application of the systems approach, practical use of the process involves the cyclic concept suggested in Figure 1.2. As illustrated, in the figure, the constant revision of past steps along with projections of future effects serve to produce a much stronger and improved system. Empirical testing of the system solidifies the process and provides maximum effectiveness. Through this process designers can actually set design objectives describing acceptable evidence of successful system operation, and continue the design

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process until that point of quality has been reached [Ref. 1]. Instructional systems Development can then be thought of as a repetitive process of analysis, design, verification, and revision. While reviewing the methodology and application of ISD in the armed services, Vineberg and Joyner [Ref. 7] characterize the sequence of procedures constituting ISD as follows: (1) the rigorous derivation of training requirements from job requirements, (2) the selection of instructional strategies so that the efficiency of training is maximized, and (3) interative trial and revision of instruction during development until training objectives are met.

Utilizing the ISD process for instituting or revising training within the military services is strongly supported by the Department of Defense. Within the military establishment there exists several models or variations of the model constructed for standardization of the ISD process for the armed forces. The standardization model is presented in five documents titled <u>Interservice Procedures for Instructional System Development</u> (IPISD), and is published by the Navy as NAVEDTRA 106A [Ref. 8]. The model was developed for the Army and later gained approval from the Interservice committee on Instructional Systems Development. It provides detailed procedures for conducting ISD. The Army uses this exact model, distributed as TRADOC Pamphlet 350-30 [REf. 9]

for their ISD purposes, while the Navy has published a condensed version of the model for its own use, titled Procedures for Instructional Systems Development in NAVEDTRA 110A [Ref. 10].

The Marine Corps uses a greatly reduced version of the IPISD model that has been altered to meet Marine Corps' documentation requirements. Guidelines can be found in Marine Corps Order P151.23B [Ref. 11]. The Air Force model varies somewhat from the IPISD model. Their version of the ISD process can be found in Air Force Manual (AFM) 50-2, Instructional System Development [Ref. 6] and Air Force Pamphlet (AFP) 50-58, Handbook for Designers of Instructional Systems [Ref. 12]. AFM 50-2 provides an overview of the Air Force's ISD model, while AFP 50-58 gives detailed procedures for implementing the concepts in AFM 50-2.

Since this thesis deals with Navy training, the focus of this discussion will be directed towards the IPISD model. As stated in the letter of Promulgation for NAVEDTRA 110A [Ref. 10] (the Navy's condensed version of IPISD), the manual "... provides guidance for the analysis, design, development, implementation, and control of instructional programs under the direct cognizance of the Chief of Naval Education and Training (CNET)." In addition the letter states that, "All curricula developed within or for use within the Naval Education and Training Command, except submarine training

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materials specified in CNETINST 1550.14, will be developed in accordance with the policy, procedures, and standards contained therein."

The IPISD model contains procedures that are primarily concerned with the "how to do it" aspects of ISD. The model is based upon nine important assumptions that must be fully understood before attempting to use the model for instructional program design, revision, or administration of an ISD training program. The basic construction of the model consists of five phases, each being a separate and distinct function. The model is designed to provide a sequential relationship of the phases.

Figure 1.3 depicts a block diagram of the IPISD model. Each phase is shown with appropriate steps to be accomplished. The five phases of the model, as shown in the figure, are labeled Analyze, Design, Develop, Implement, and Control. Phase One, Analyze, is the single most important step in the ISD process, because it establishes what the program will teach. This phase provides the procedures to define what the jobs consist of, breaking these down into a detailed listing of duties, tasks, and elements necessary to perform a specific job. The analysis involves techniques such as job interviews, questionnaires, experienced professionals using their best judgment, and group interviews.
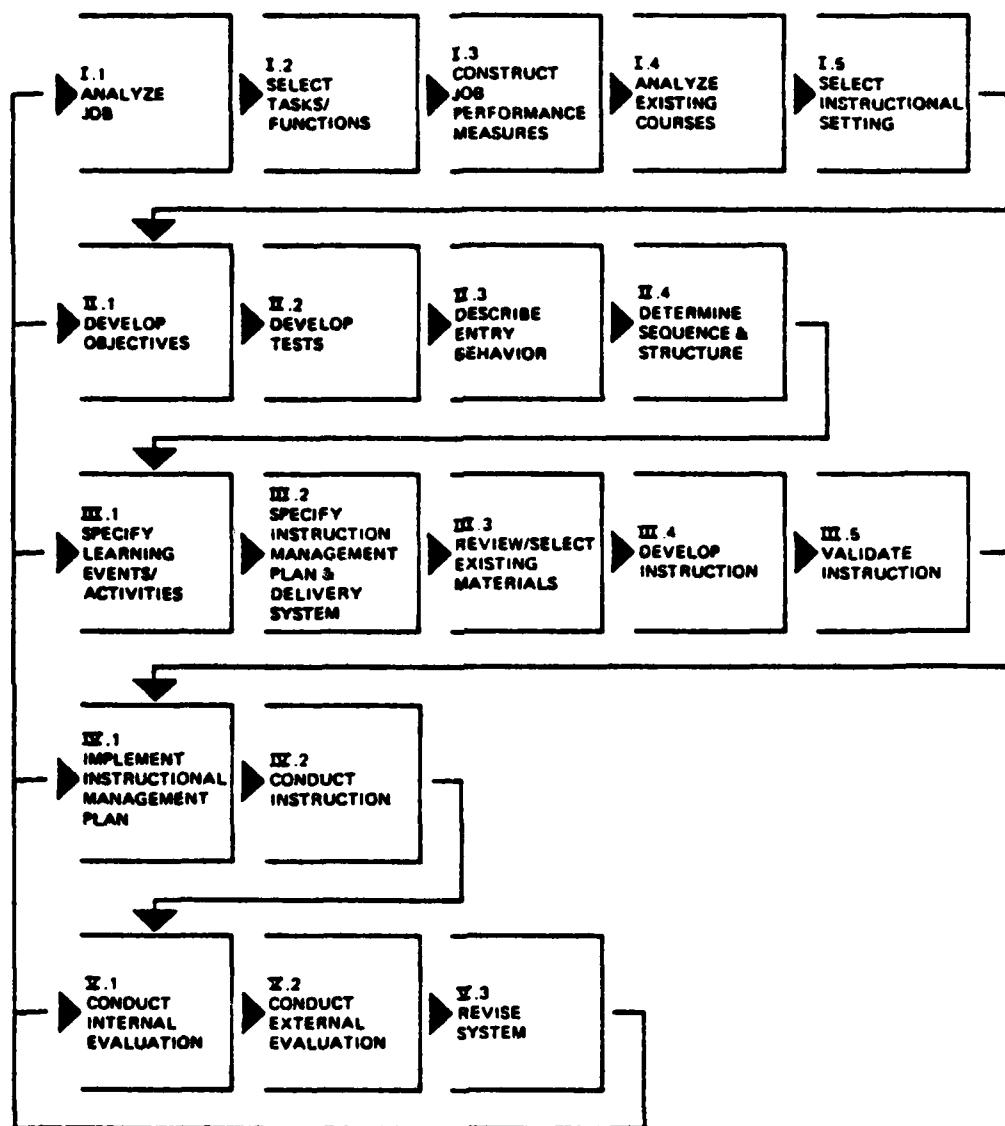
Source: Ref. 8
Figure 1.3. Five Phases of the IPISD Model

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Phase Two, Design, uses the job analysis from Phase One to begin designing instruction. The form and specifications for training are created and the identification and design of the terminal and enabling objectives that an individual must achieve in order to satisfactorily complete the program are produced. Phase Three, Develop, deals with the actual preparation of instruction. This phase specifies the knowledge and performance learning activities that will be used, develops curriculum outlines and instructional management plans, and selects instructional materials. When these products have been validated by using empirical data, Phase Four can take place.

Phase Four, Implementation, produces the steps necessary to implement the instructional plan that was developed in Phase Three, while Phase Five, Control, provides the procedures for the evaluation of the program to determine how effectively it has met the initialy set goals. An internal evaluation is conducted as a continuous process to assess student performance and to determine the effectiveness of the program methods and materials. An external evaluation determines if the course is training graduates well enough to perform, on the job, the tasks they were trained to perform,

and if these tasks are the ones required to properly do the job. These evaluations provide the basis for program revision.

As stated in NAVEDTRA 106A [Ref. 8], the design and development of instruction must follow an adequate needs analysis. In other words, when there is a known measurable discrepancy between a situation as it exists and the situation as it ought to be, instructional programs should be designed to eliminate that discrepancy. During initial applications of the ISD process, one should not set out to run a course through the process, but rather utilize the process in such manner that the need for a course becomes apparent through the use of the process.

The ISD process is an extremely sophisticated method of instructional development and contains several unique characteristics. The process uses painstaking measures to ensure proper selection of what is to be trained. This is accomplished through job surveys and experts from the field when a job already exists and from engineering data for new jobs and systems. Instructional Systems Development also generates and applies alternative training methods selected from state-of-the-art technology instead of relying on tradi- tional methodology. These advanced techniques aid in the assurance of optimal training effectiveness, time efficiency, and cost. Thus there is no need for course content reduction

to optimize a system. Finally, one of the most important characteristics of the ISD process is the provision for measuring the quality of instruction and the overall program. The process uses test data based on absolute standards of performance to grade students and check program quality. One last point that should be noted about ISD methodology is its flexibility. When utilizng the process the model can be entered at any step, or if appropriate, actions can be taken in several steps simultaneously.

It should be clearly evident that the ISD process can be extremely beneficial in the area of instructional design. The process can be adapted to any training program including on-the-job training. One can use the process to design new instructional programs or to change and improve existing ones. Since the process has been in use for several years, empirical evidence now supports the claims of improved effectiveness, time efficiency, and costs with proper application of ISD. Although many still consider the process an art, it is by far closer to a science of education than the other approaches to instructional design that do not include measurement of their effects.

B. THE P-3 INSTRUCTIONAL SYSTEM

During the latter part of September 1974 the Commanding Officer of VP-31, in a letter addressed to Commander Patrol Wings, U.S. Pacific Fleet [Ref. 4], stated that the P-3 ASW

community was in serious need of a new training program to overcome manpower and monetary shortages and still provide quality training to personnel enroute to fleet squadrons. He went on to say that the training program should be developed by the methods of a systems approach to training. As justification for requesting this particular type of instructional system design, he cited the Naval Training Equipment Center's (NTECs) Training Analysis and Evaluation Group (TAEG) report number 10 [Ref. 13] which contains the results of an experimental P-3 pilot and flight engineer training program. The experiment demonstrated the efficiency and economy of a systems approach to training by indicating a potential media and manpower savings of six million dollars per year in just that one portion of FRS training. The Commanding Officer of VP-31 further stated that as trainers advance in sophistication, complexity, and cost, the systems approach to training could be used as a tool to ensure that FRS training needs are met and at the same time guard against the waste of allocated funds.

As a solution to the FRS training problem, the framework for an instructional development program employing the systems approach was submitted. The program was patterned after the S-3 Fleet Instruction Team program, and was designed to: (1) teach only the essentials for successful job performance in the fleet, (2) employ the latest and best

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technology in design considerations, and (3) maximize the use of available resources (i.e., training aids, aircraft, and manpower).

With processing through normal channels complete and approval obtained, Courseware, Inc. was commissioned along with Navy and government personnel to provide the expertise for the new training program. These developmental personnel were formed into an Instructional Systems Development Team consisting of subject matter experts (SMEs), instruction psychologists (IPs), and technical assistants (TAs). The results of their efforts provided training programs for thirteen positions on the P-3 A/B and P-3C aircraft incorporated into eleven volumes.

The team of experts employed the ISD process for the program design, which was, by this time, the method required by all uniformed services. Courseware, Inc. concurred with this state-of-the-art approach, stating that it offered the best opportunity for effective, efficient, and motivating instruction. Thus the philosophy underlying the design concept adopted by Courseware, Inc. was: determine what to teach, determine how to teach it, and determine whether or not the teaching has been successful.

The basic systems approach developed and validated by Courseware, Inc. is based upon six assumptions that describe their philosophy on the when, how, and why of instructional

design. The ISD approach they developed for the P-3 Instruction system consists of ten major steps which served as the framework for the project. The steps for the most part follow those of the IPISD model presented in the last section, therefore they will not be covered in any great detail.

Step one, job analysis, breaks the job down into component tasks. The level of detail is kept relatively general through this step. Step two, selection of tasks for training, identifies those tasks listed in step one that must be trained in the program. Step three, hierarchical analysis, converts job requirements to a set of specific training objectives. This step reduces the tasks of step one to a more specific level of detail. These new tasks are presented in the form of a task diagram which is used to aid SMEs.

Step four, media selection, provides media alternatives to fit the learning requirements for each objective. The media alternatives selected for the program were workbooks, videotape, slide/tape, and simulators. Step five, sequencing of objectives, constructs the order in which training materials will be presented to the student. Step six, lesson specification, expands each sequenced objective to aid the course writers. Step seven, authoring lessons, creates sound instruction given a specification of strategy, content, and

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media. Step eight, production of tests, creates lesson tests to measure student learning and course effectiveness.

Step nine, training, is the actual use of instructional materials with students. Step ten, evaluation, uses empirical means to determine whether students are learning the course material, if students can perform adequately on the job, and if the course is presenting the proper information for the job to be completed. This step was scheduled to occur during the first year of training. These ten steps provided the basis for the training system development.

Coincident with the completion of the work established by the ten basic steps of the design system was the production of the P-3 Instructional Systems Management Plan. The purpose of the plan was to provide explicit guidelines and procedures to aid in the implementation of the training materials evolving out of the development of the new training program. The plan was also devised to maintain the materials in an up-to-date status as new systems and procedures arise and as revisions are required.

The management plan covers such areas as administrative details, scheduling, course materials, equipment, facilities, and quality control. Additionally, the plan assigns specific organizational responsibilities to VP-31 and to the Fleet Aviation Specialized Operational (FASO) Training Group Pacific Fleet Detachment Moffett.

II. STATEMENT OF PROBLEM

A. PROBLEM STATEMENT

The primary mission of the peace-time Navy is to train for its role as protector of the seas, in time of aggression against the United States (U.S.) or in support of U.S. interests. The success of the Navy's overall training system is determined by how well the numerous training subsystems meet their pre-established goals. The attainment of these goals plays a critical part in the bid to reach and maintain a high-level of Fleet readiness. Thus, designers of Naval instructional systems must constantly strive to create programs that are optimally effective, time-efficient, and as cost-effective as possible to operate. The only way to insure the development of such high-caliber programs is to include, within the program, a check-and-balance phase that will provide continuous revision both during design and after the program becomes operational.

Since the early 1970's the Chief of Naval Education and Training has considered the measurement of training effectiveness through evaluation of trainee performance, a matter of major concern. Despite this high level of concern, the ability to design and successfully incorporate meaningful training system appraisal continues to be a problem throughout the Navy and all other branches of the military

service.   The most common denominator in this problem is, as most would expect, a lack of adequate assets to properly operate the evaluation phase of instructional systems, even after the phase has been designed as an integral part of the training program.

The P-3 Instructional System based on ISD methodology, was implemented as the FRS training program at VP-31 in January 1979.   The system was designed with the intention of covering every facet of VP Antisubmarine Warfare Training required to make optimum use of the P-3 aircraft.   A quality control plan was included within the system to validate all aspects of the instructional design and to provide the necessary means for program revision when appropriate.   The design of the evaluation plan was unavoidably restricted by constraints stemming from inadequate assets.   Additionally, when the training system was implemented, the available funds and manpower were insufficient to allow the inclusion of the evaluation phase of the system.   Thus, not only was the evaluation plan incomplete according to classical ISD standards, but also the plan, as it existed, was never formally implemented into the training system.

Another serious problem plaguing the Quality Control plan was a material/media revision. Shortly after the training system was implemented in 1979, it was discovered that due to such discrepancies as instructional design errors, technical

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content changes, and editorial errors, some of the designed materials would have to be immediately revised. These revisions included a change in format for tests. The necessary changes were immediately incorporated into the system without being validated. This violated the systematic basis for the instructional design process and seriously jeopardized the evaluation plan, especially in the area of internal evaluation.

The P-3 Instructional System, as it exists today, appears to be superior to the traditional system, but the only way this can be verified is through an appropriate evaluation plan. Without a procedurally correct evaluation plan in effect, the ability to determine whether system objectives are being met and graduates are capable of satisfactory performance on the job on a continuous basis, is questionable at best. The currently used method of evaluation is informal in nature, and for the most part, consists of sporadic usage of a traditionally constructed student critique/questionnaire and word-of-mouth reports at monthly conferences held by Commanding Officers of Fleet Squadrons.

Initial justification for the redesign of VP FRS training as stated in Chapter One was to provide a high-quality training program that could readilly adapt to new and advanced technology while reducing operating costs and manpower needs. To meet these requirements a new instructional pro-

gram was designed using the ISD process, which is a closed-loop system. The evaluation phase of this type of program is required to provide systematic maintenance and revision. Without proper evaluation, there cannot be a closed-loop system, but only a rigidly structured traditional-type training program. Theoretically one can say that without an evaluation phase, there is no such thing as an ISD program.

To correct the Quality Control Plan shortcomings mentioned above, a problem that must be addressed is, how can a complete evaluation phase be incorporated into the P-3 Instructional System to regain the benefits of the powerful ISD concept under which it was designed?

The intent of this thesis is to make contributions towards a more effective VP FRS training system. Recommendations will be presented for the completion and incorporation of the P-3 evaluation process, which will aid in a better overall training program.

B. THE IMPORTANCE OF INSTRUCTIONAL SYSTEM EVALUATION

The undisputed need for measurement of training effectiveness has long been realized. Without the capability of determining how well the instructional program is being designed, if students are meeting design objectives, and whether or not students are properly trained for, and are capable of, adequately doing their job in the fleet, a

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training system can only be mediocre at best. According to Hall, Rankin, and Aagard [Ref. 14], a major problem plaguing traditional training systems, (i.e., non ISD systems) is the determination of training effectiveness largely by rational assessment and intuitions of personnel intimately involved in the training process. They further state that this type of information tends to be biased and lacks the detail necessary for improving specific aspects of training. Therefore, to determine training effectiveness and obtain information suitable for proper training quality control, one must seek more objective and systematic means. The ISD process of instructional development employs these concepts for training system evaluation.

The remainder of this Chapter will cover the basics of training system evaluation followed by an overview of the evaluation methods utilized in the IPISD model. Finally, the steps utilized in the quality control phase of the P-3 Instructional System will be discussed.

1. The Nature of Instructional System Evaluation

Evaluation of an instructional system can best be described as a means of analyzing and interpreting system evidence that has been systematicaly gathered. The basis for training program evaluation begins with a consideration of criteria and criterion measures. When dealing with training programs, two classes of criteria, internal and external

measures, must be considered. Internal criteria are measures concerned with an individual's performance in the training situation such as objective exams, and questionnaires reflecting trainee attitude changes. On the other hand, external criteria are utilized to assess performance on the job for which the training program was designed. Measures of quantity and quality of production are examples of external criteria.

According to Landry and Trumbo [Ref. 15], Kirkpatrick [Ref. 16] identified four "levels" of criteria for the evaluation of training programs: reaction, learning, behavior, and results. The reaction and learning levels are internal criteria. Reaction criteria deals with how the student feels about the training program and learning criteria attempts to measure how much was learned as a result of the training. The last two levels are external criteria. Behavioral criteria measures performance on the job, while results criteria determines the utility of the instruction with respect to organizational objectives.

When building the framework for training system evaluation, one must carefully strive for the proper balance of internal and external criteria. The careful measurement of internal criteria can provide valuable information, but these measurements cannot tell what impact the training has had on job behaviours or organizational goals. Evaluation of

the payoff resulting from a training system is determined not from what is learned in training but how the individual performs on the job.

While describing the principles of instructional design, Gagne' and Briggs [Ref. 1] present three specific questions concerning instructional systems that should be answered as a result of the designed evaluation process: (1) how well have the stated objectives of instruction been met, (2) is the new program better than the one it is replacing, and (3) does the new program produce any additional effects?

Evaluation of topics, courses and instructional systems is carried out in two stages. Stage one, formative evaluation, is undertaken while the new unit is being developed. Its purpose is to provide evidence for use in making revisions and improvements. This stage is often called system validation. Stage two, summative evaluation, is concerned with the measurement of student performance once the course or program has been developed. In other words, it is primarily concerned with instructional system effectiveness. The focus of this report will be on summative-type evaluation.

The basic ISD structured training models used by the Armed Services makes provision for summative evaluation to be conducted in two parts. Part one, internal evaluation, is a continuous process designed to check instructional

effectiveness (i.e., are the students obtaining course objectives?). The primary measure of effectiveness is made via objective-reference achievement tests. Other measures include time to complete lessons, attrition rates, and the opinions of instructors and students concerning the training. Part two, external evaluation, is designed to measure the performance of the graduate on the job. The purpose of this type of evaluation is to discover deficiencies in a graduate's ability to perform certain required tasks when they reach the job. Once the causes of the deficiencies are determined, revisions to the system can be made to correct the flaws. External evaluation also ensures that the information obtained from the training program is the information needed to do the job. The two most accurate methods of external evaluation, testing of graduates on the job and direct observation, are usually too costly; therefore, more often than not evaluators must rely on supervisors' summary evaluation of performance, questionnaires and interviews.

The most important points concerning the conduct of an external evaluation are first, they must be extremely specific (task level) to isolate inadequate performance, and second, it must take place within a few months after the graduate has reached the job so that the skills and knowledge

acquired on the job will not influence the information received from the training program.

2. The IPISD Model Evaluation Process

The Interservice Procedures for Instructional Systems Development Manual [Ref. 8] lists course evaluation as the final phase of instructional design. This important step represents the beginning of a perpetual training system evaluation process that is intended to make certain that the training program continues to be effective and to provide a student output quality level that satisfies fleet requirements.

The IPISD model evaluation phase capitalizes on the two aspect evaluation processes (internal and external) described in the last section. The internal evaluation program is used to determine if a course has been developed/conducted according to the "standards" specified in the ISD procedures. Thus, the internal quality control aspect seeks to answer the question, "Is the course teaching its stated objectives?". The IPISD model specifically states that the effectiveness of both the instruction and the ISD process itself will be evaluated.

The data gathered for the internal evaluation process deals primarily with student achievement (i.e., attainment of the objectives, as represented by test scores). The model also recommends collecting information such as trainee

background, entry skills, trainee's evaluation of methods and media, time to complete lessons and instructor's evaluation of the content. This kind of information will permit identification of weak, ineffective, impractical or unpalatable instruction, and thereby lead to the necessary revisions in the instructional program.

The external evaluation program determines the adequacy of the instructional design and development process, and trainee proficiency, by a standard external to the course. This standard is normally the performance of the graduate on the job. The external evaluation process considers the questions, can the graduate do the tasks required on the job, and has the job changed since it was last analyzed? Data gathered for the evaluation may be obtained from graduates and/or their supervisors. In an overview of the IPISD Model external evaluation process, NAVEDTRA 106A [Ref. 8] stipulates that information that can be obtained from course graduates includes their opinions about: how well they believe they can perform on the job, training received since arriving on the job, how well the course prepared them for the job, the parts of the training which were relevant to the job, and the job-related tasks which caused them the most problems. Additionally, they state that the information that may be gained from supervisors includes: how well the graduates can do the job,

how those graduates measure up to those who received a different form of training, and areas in which the graduates have not been properly trained.

The IPISD model recommends the administration of Job Performance Measures (JPMs) in the field 30-90 days after graduation as the means of determining whether or not graduates can perform their required job tasks. Job performance measures are "tests that are used to evaluate proficiency of a job holder on each task he performs." [Ref. 8] The Model states that other methods such as interviews and questionnaires may be used, but that these techniques usually inject a certain amount of bias into the evaluation process.

Determining whether or not a job has changed since it was last analyzed is a matter of reviewing the present relationship between the Job Performance Measures and actual job requirements. Vineberg and Joyner [Ref. 7] describe this process as determining the predictive validity of the Job Performance Measures.

Most prominent instructional designers seem to consider the administration of Job Performance Measures to graduates as the most reliable way to measure the adequacy of instructional design. This method provides the most accurate means of isolating the causes of performance discrepancies during the evaluation, but it should be pointed out that it

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is also the most expensive to use. The bottom line in external evaluation is summed up very explicitly in the IPISD model caution: don't revise simply for the sake of revision. When the majority of graduates and supervisors are satisfied with the quality of training, few, if any, system changes are usually needed.

3. The P-3 Instructional System Evaluation Process

The final phase of the P-3 Instructional System is dedicated to quality control. The purpose of the Quality Control program is to ensure that the system is meeting its goals in the most optimum manner possible. The program's general framework is composed of two primary parts. Part one, quality control of materials, aids in the assurance that all applicable materials are up-to-date and technically correct. Part two, quality control of the instructional system itself, aids in the assurance that the system is functioning effectively.

Generally speaking, the quality control program's basic guidelines specifies that material revisions will be made when the performance data gathered from device sessions indicate a need to revise the written material that teach the performance and when data support the existence of a content or instructional deficiency. Data gathered for these evaluation purposes may be obtained from instructor or student inputs, analysis of student performance and attitude

data, and the Naval Air Training and Operating Procedures Standardization (NATOPS) manual update process.

Part two, quality control of the P-3 Instructional System itself, is a continuous process devised to identify and resolve problems within different aspects of the system. System revisions, to correct problems, are designed to be made without deteriorating other parts of the system. Thus, any problem should upgrade the entire system and not correct one problem at the expense of creating new ones elsewhere in the system. Revisions to the system may originate from changes in the Master Course Syllabus (the primary scheduling tool for the Instructional System), in resource requirements, in management procedures, or in course content. Strict documentation and distribution of revisions are extremely important in this instructional system, since the system is large and the two units using it are geographicaly separated.

This, of course, has been a very broad overview of the quality control phase of the P-3 Instructional System. The entire phase is very detailed and complex as one would expect from such a large training program. A more thorough discussion providing all of the necessary details will be presented in Chapters Three and Five.

C. SCOPE OF THESIS

When one strictly adheres to ISD methodology, internal evaluation (i.e., evaluation to determine the effectiveness of the performance of an instructional product) and external evaluation (i.e., evaluation of the training product in the operating environment) are extremely complex tools to design, implement and operate. Each procedure of an ISD based evaluation plan is related to the entire instructional system in such a manner that if a nonvalidated change is made in the system, the evaluation plan can be seriously degraded. This appears to be especially true in the area of internal evaluation. For example, the media/materials revision of the P-3 Instructional System that took place in 1979 has made it necessary for numerous design changes to be made to the Quality Control Plan before an accurate internal evaluation process can exist. Due to the extent of these required design changes, an analysis of the entire P-3 Instructional System Quality Control Plan (i.e., internal and external evaluation) is beyond the scope of this thesis. Since the question that needs an immediate answer (i.e., the bottom line in VP training) is, can the VP FRS graduates perform satisfactorilly on the job, the scope of this report will be limited to an analysis of the external evaluation process.

III. P-3 INSTRUCTIONAL SYSTEM EXTERNAL EVALUATION SPECIFICS

The instructional system that is designed according to an ISD model is constructed as a complete cycle. The evaluation phase is the key element in that it provides feedback necessary to complete the cycle. This feedback is the means of ensuring continuing quality in graduate performance. Evaluation is that integral part of the training system with the capability to locate discrepancies and initiate system changes. An evaluation process is not a general item that is used to "check" a training system, but rather a specific tool that must be designed for each individual system.

The evaluation process designed by Courseware, Inc., for incorporation into the FRS Training System is titled the P-3 Instructional System Quality Control Plan. As stated in the last chapter, the plan was designed under constraints that prevented the development of complete procedures necessary for evaluation of the system. The resulting shortcomings in the plan and their possible remedies will be discussed in Chapter Five of this report.

Chapter Two presented, in part, a general overview of both the IPISD model evaluation procedures and the P-3 Instructional System evaluation procedures for background information. This chapter will focus on the details of

evaluating the P-3 Instructional System, especially in the area of external evaluation. The material that is presented is a summary of the P-3 Instructional System Quality Control Plan [Ref. 17] and Management Plan [Ref. 18] and is intended to provide the reader with enough detail to follow the analysis of the plan in Chapter Five. The plan is presented just as it was designed by Courseware, Inc. The first three sections of this chapter provide general information that pertains to the entire quality control plan (i.e., internal and external evaluation), while the remaining two sections will cover specifics of the external evaluation plan.

A. PURPOSE OF THE QUALITY CONTROL PLAN

Quality control provides the means for instructional personnel to systematically ask questions designed to evaluate the training program. The devised plan to conduct quality control involves three major activities: data gathering, analysis and revision. The constraints placed upon data gathering produce a chain reaction resulting in similar limits being placed upon the level of analysis that can be accomplished and finally dictating the number and kinds of revisions that can be made to this program.

Three distinctly separate stages occur in the quality control effort. The first stage, validation, takes place during the actual development of the instructional program, and involves trying out designed material with individual

and/or small groups. This stage allows instructional designs
to guarantee specified results. The second stage, internal
quality control, is a continuous process that takes place
during the implementation of the training program. This
stage provides for the identification and correction of
deficiencies in the total training program (i.e., both
management and materials).

The third stage, external quality control, takes place
several months after course graduates depart for fleet
assignments. This process attempts to identify and correct
problems pertaining to the areas of course relevance to real-
world operational requirements. Internal and external
quality control must be conducted continuously to
satisfactorily maintain the training program. Figure 3.1
details the entire P-3 Instructional System quality control
process and its outputs. Note the connecting nature of the
process that links all three stages together.

B. SCOPE OF THE QUALITY CONTROL PLAN

This quality control plan was designed to cover the
personnel and procedures required during the internal and
external quality control stages. During internal quality
control, data gathering and analysis will be directed towards
answering the question, "is the training program effectively
meeting its defined instructional and performance

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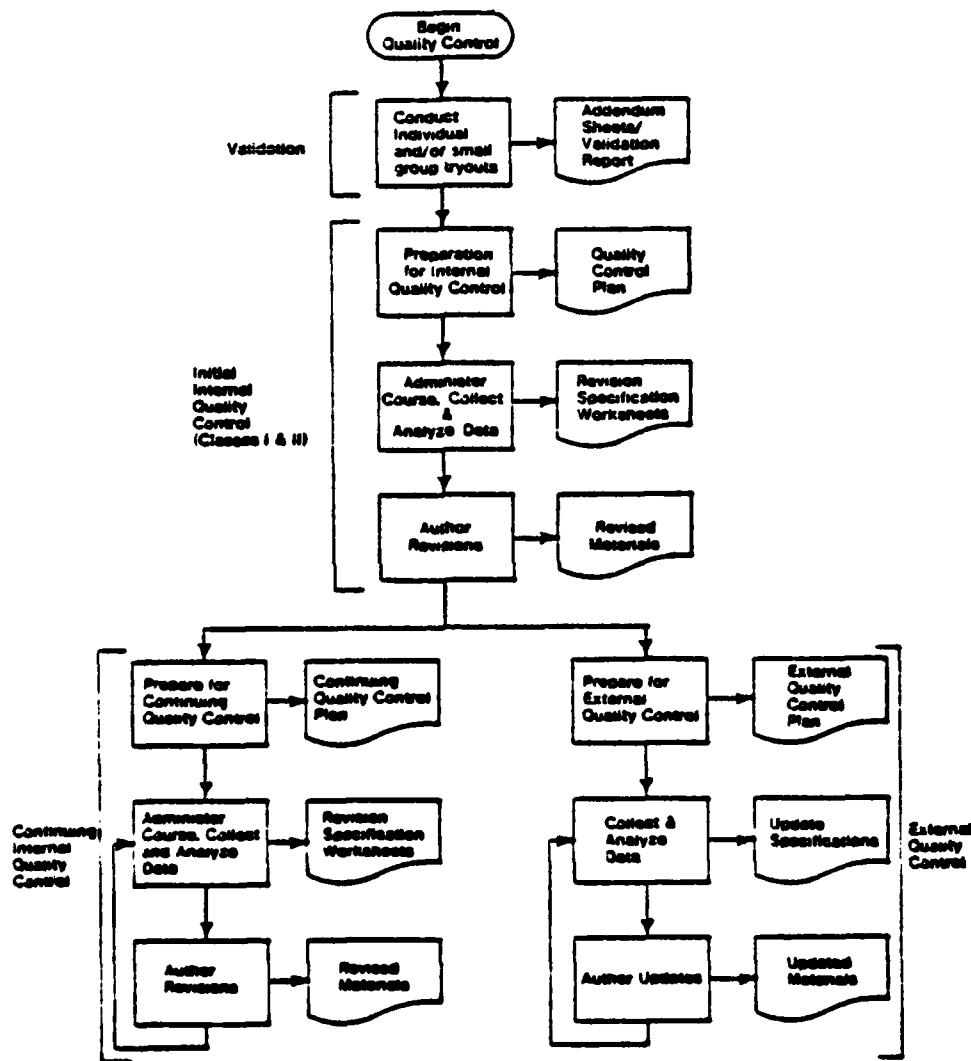
Source: Ref. 5: p. 2
Figure 3.1. Quality Control Process

objectives?" This phase of the quality control process is primarily concerned with whether or not students are meeting established minimum performance requirements.

The external quality control portion of the plan will direct its data gathering and analysis toward answering the question, "is the training program focusing on skills and knowledge required in the real operational world?" This process addresses two kinds of discrepancies: (1) errors associated with initial task listing or task selection procedures, and (2) dated concepts and procedures.

Due to imposed constraints such as time, manpower, and money, this quality control plan does not address the following:

(1) Procedures for quality control of the instructional management system; this area is covered in Appendix I of the P-3 Instructional System Management Plan.

(2) Complete procedures for the external quality control plan; due to the time requirements for data collection and analysis, the timeframe for completion of the external quality control process would have extended beyond the scope of the contract for development of the P-3 Instructional System.

(3) Continuous evaluation and revision procedures; these procedures are best identified toward the end of the internal quality control process on the basis of a needs assessment. The needs assessment and identification of maintenance ongoing revision procedures were intended to be a joint Courseware/Navy endeavor based on the experience of the initial quality control plan.

C. CONSTRAINTS OF THE QUALITY CONTROL PLAN

The extent of the evaluation (i.e., the total number and kind of evaluation questions that can be addressed during internal and external quality control) is dependent upon existing priorities or client constraints.

1. Design Accomodations

The quality control plan was custom designed to accomodate the following restrictions:

(1) Fixed Naval personnel resources: this limitation affects the amount and kind of data collection activities during internal quality control.

(2) Fixed trainer assets: this limitation imposes strict enforcement of scheduling which limits the time available for student/instructor interview data collection.

(3) Fixed course length: this limitation was applicable during the implementation year. It didn't allow enough flexibility in training time to make up for initial instructional or system deficiencies.

(4) Fixed number of students within a fixed contract delivery schedule: this restriction may result in a non-representative target population sample size. Additionally, initial training program effectiveness may be degraded by an insufficient amount of trainer assets.

(5) Training accountability: during the implementation year this restriction forces the emphasis to be placed on training rather than data collection for analysis and revision of the instructional materials.

(6) Learning environment limitations: lack of readiness in this area restricted the evaluation of the instructional materials and the efficiency of the instructional management system.

2. Revision Priorities

Based upon the above considerations, several revision priorities were established for internal quality

control. Since the primary focus of this report is on the external evaluation phase, the priorities will not be covered, but may be found in their entirety in the P-3 Instructional System Quality Control Plan. Revisions made to the training program will be made according to the kind and amount of data collected.

D. DESIGN OF THE EXTERNAL QUALITY CONTROL PLAN

This section of the Quality Control Plan discusses the general procedures to be used in conducting the development, data collection, analysis, and revision phases for external evaluation. Further procedural detail was intended to be provided through a joint Navy/Courseware endeavor upon completion of the second class of students for internal quality control.

1. Development Phase

The purpose of the development phase is to provide data collection instruments for use in the data collection phase. When considering analysis, the following questions apply:

(1) Can the initial course graduate perform at the level expected while on the job?

(2) Has the initial course graduates' training been too extensive in any skill area?

(3) Has the initial course graduate attained the proper knowledge and skills upon arrival at the operational squadron?

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(4) Does the initial course graduate feel the training program adequately prepared him for the real-world job tasks?

Attempts to answer these questions will be conducted through two types of data collection instruments. The first type, questionnaires, will be sent to squadron supervisors of initial course graduates and course graduates themselves. The second type, interview questions, will be administered on-site to both supervisors and course graduates.

2. Data Collection Phase

This phase consists of two major steps:

(1) Questionnaire data gathering activities.
(2) On-site interviews with supervisors and initial course graduates who have been on the job approximately six months.

Questionnaires will be sent to all initial course graduates and their job supervisors. For this particular quality control plan, four questionnaires currently exist. Appendix A shows a sample initial course graduate follow-up questionnaire, while Appendix B shows a specific sample course graduate questionnaire for the pilot student. Appendix C displays a sample job supervisor follow-up questionnaire and Appendix D shows a specific sample job supervisor follow-up questionnaire for a pilot supervisor. As specified in the Management Plan, follow-up questionnaires will be returned to the VP-31 Instructional System Department, for data summarization and analysis, by course

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Subject Matter Experts (SMEs). On-site interviews will be conducted at sites selected by the Navy.

3. Analysis Phase

This phase addresses the following activities:

(1) Summarization of collected data.
(2) Analysis of collected data.
(3) Revision procedures on the basis of analysis.

Discrepancies in task skills or knowledges will require task analysis and identification of learning goals. Learning goals will be recorded on the Revision Specification Worksheet (Appendix E), placed in a learning heirarchy and assigned for authoring. The course syllabus will be modified as necessary.

The Management Plan assigns (SMEs) the responsibility for summarizing and analyzing supervisor and course graduate questionnaire responses. The SMEs' duties consist of comparing fleet squadron input to input from other data sources. They then determine what action is to be taken to correct discrepancies. The summarized/analyzed data is then forwarded to the training officer/course supervisor for review. The Management Plan also requires a few specific steps to be carried out in the analysis data stage. These actions are discussed in Chapter Five.

4. Revision Phase

The revision phase is the responsibility of the ISD Department of the Navy. The instructional materials will be

revised in accordance with revision specifications from the analysis phase. According to the Management Plan, revisions, for the most part, will be dictated by the data collection and analysis results. SMEs and instructors will determine jointly, the nature and extent of the revisions to be made, but SMEs are ultimately responsible for instituting the actual changes. A few specific procedural details concerning revisions are presented in the Management Plan. These procedures will be discussed in Chapter Five.

E. PERSONNEL AND SCHEDULING REQUIREMENTS

The development and data collection phases were to be initiated by Courseware, Inc., and due to the time requirements for questionnaire distribution and on-site interviewing, the analysis and revision phases were to be conducted by the Navy.

IV. METHODOLOGY

The data used in this thesis came from Uniformed Services publications, commercial books and reports, and various studies conducted by and for the Military Services. This data reflects the current design, implementation and operation standards for United States Navy training programs. Additional background data was gathered through informal interviews with various VP FRS training administrators and managers.

The intention of this thesis will be realized through the analysis of the P-3 Instructional System External Evaluation Plan. The plan will be related to the Interservice Procedures for Instructional System Development model external evaluation process as well as other standardized ISD concepts. From this analysis, a better understanding of the external evaluation plan will be gained, and recommendations for an improved evaluation process and overall training system will be made. The report will conclude with a discussion on the feasibility of implementing the Quality Control Plan.

V. ANALYSIS OF THE P-3 INSTRUCTIONAL SYSTEM EXTERNAL

EVALUATION PLAN

Previous sections of this thesis have related the importance of utilizing the ISD process to develop VP FRS aircrew training, how an evaluation process is essential to the creation of the closed-loop training system, and the development status for the P-3 Instructional System Quality Control Plan. This section will analyze the existing P-3 Instructional System External Quality Control Plan. The author realizes that due to extenuating circumstances the plan, as it now stands, is not complete, continuous, or incorporated into the FRS training program. This analysis is being conducted to offer suggestions that should aid in the completion and implementation of the plan; thus resulting in an improved VP FRS aircrew training system. This analysis of the P-3 Instructional System External Evaluation Plan is not an attempt to segregate it from the remainder of the system, but is simply an attempt to focus on improving one aspect of the training program with the intention of strengthening the entire system.

The procedure for the analysis will consist of comparing the external evaluation phase of the P-3 Instructional System to the external evaluation phase of the IPISD model. The IPISD model was chosen as the comparison standard because it

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provides a description of the approved techniques and procedures to be used for interservice training and includes requirements from all branches of the Armed Services. Additionally, Vineberg and Joyner [Ref. 7] found, in a study of all Armed Forces ISD models, that following external evaluation, the IPISD model provides the most guidance for isolating causes of performance discrepancies. The format for the comparison will consist of presenting a summary of each step of the IPISD Model external evaluation procedures immediately followed by a discussion concerning the P-3 Instructional System External Quality Control Plan accomplisments for that step and suggested recommendations for changes to the plan.

The section will conclude with a discussion of the feasibility of implementing the external evaluation program, once it has been redesigned and can meet the appropriate ISD standards.

A. COMPARISON OF THE EXTERNAL EVALUATION PROCESSES

1. Introduction

The IPISD Model specifies that the primary purpose for conducting external evaluation is to ensure that course graduates can do the job for which they were trained, at the expected level of competency. External evaluation also checks to see if the job has changed since it was last

analyzed, thus, in a sense, providing a revalidation of the last task listing. Figure 5.1 illustrates the position (Block V.2) in the ISD cycle where external evaluation takes place. One must understand that although the evaluation is conducted after students have successfully completed instruction and reported to the job, it is still a part of the closed-loop process required in an ISD training program.

I.1 ANALYZE JOB	II.1 DEVELOP OBJECTIVES	III.1 SPECIFY LEARNING EVENTS/ACTIVITIES	IV.1 IMPLEMENT INSTRUCTIONAL MANAGEMENT PLAN	V.1 CONDUCT INTERNAL EVALUATION
I.2 SELECT TASKS/FUNCTIONS	II.2 DEVELOP TESTS	III.2 SPECIFY INSTRUCTION MANAGEMENT PLAN & DELIVERY SYSTEM	IV.2 CONDUCT INSTRUCTION	V.2 CONDUCT EXTERNAL EVALUATION
I.3 CONSTRUCT JOB PERFORMANCE MEASURES	II.3 DESCRIBE ENTRY BEHAVIOR	III.3 REVIEW/SELECT EXISTING MATERIALS		V.3 REVISE SYSTEM
I.4 ANALYZE EXISTING COURSES	II.4 DETERMINE SEQUENCE & STRUCTURE	III.4 DEVELOP INSTRUCTION		
I.5 SELECT INSTRUCTIONAL SETTING		III.5 VALIDATE INSTRUCTION		

Source: Ref. 8: p. 63
Figure 5.1.   IPISD Model Block Diagram

The IPISD Model requires the following sources of input data to conduct external evaluation:

(1)   All available data from internal evaluation.

(2)   The job analysis, task selection, job performance measures, and setting selection information developed in Phase One.

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(3) Any documentation approved by higher authority which will change the requirements of the course.

Procedurally correct and properly conducted external evaluation will either confirm that course graduates can do their job at required performance levels or that students cannot meet job performance standards and which tasks are causing this failure. The specific steps for planning and carrying out external evaluation are shown in Figure 5.2.

Discussion: Basically the IPISD Model and the P-3 Instructional System External Quality Control Plan (QCP) seem to agree on their underlying philosophies for conducting external evaluation. Both models are primarily concerned with whether or not: (1) graduates can adequately handle the job for which they were trained, (2) the job task requirements have changed, and (3) course updates due to material revisions can be made.

The QCP states in its introduction that specific procedures for external quality control will not be given due to contract time limitations. Therefore, an initial external evaluation of the P-3 Instructional System was never conducted nor were procedures identified for ongoing evaluation and revision. It should be reemphasized that although these procedures were never devised, the QCP does concur that they are necessary.

INPUT

| ALL DOCUMENTATION OF BLOCKS I.1, I.2, AND I.3 LISTS OF PROGRAM GRADUATES, RECORDS OF THEIR PERFORMANCE, AND OTHER PERTINENT INFORMATION |

COLLECT BASELINE DATA 2.2.1

PLAN EVALUATION 2.1

COLLECT JOB PERFORMANCE EVALUATION DATA 2.2.2

COLLECT DATA 2.2

COLLECT QUESTIONNAIRE DATA 2.2.3

COLLECT PERSONAL INTERVIEW DATA 2.2.4

CONSOLIDATE DATA AND MAKE RECOMMENDATIONS 2.3

OBTAIN RECORDS OF STUDENTS' PERFORMANCE DURING INSTRUCTION 2.2.5

BLOCK Y.3

Source: Ref. 8: p. 86
Figure 5.2.   External Evaluation Steps

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The QCP design was hampered by several constraints. Although most of the constraints were primarily concerned with either the total initial evaluation effort, or internal evaluation, one constraint had a serious effect on the external evaluation program. The constraint of concern is a shortage of naval personnel resources. This lack of properly trained personnel imposes serious restrictions on successful evaluation planning, data collection, data analysis, and training program revision.

Recommendations: The total benefit derived from an ISD structured training program cannot be realized without adequate personnel capable of conducting external evaluation. Sufficient quantities of knowledgeable personnel should be formed into a team that is capable of providing continuous evaluation. Optimally the team should be well versed in the area of ISD procedures and techniques, should have a good understanding of the job to be evaluated, and should not be connected to the training program. One possibility for forming such a team is to employ an instructional psychologist as team leader and use IS Department SMEs/track managers rotating out of VP-30 and VP-31 as the remaining members to form an independent evaluation unit. Another means of forming the evaluation team could be through utilization of personnel from agencies such as TAEG, NTEC, or Naval Instructional Technology Development Center (NITDC).

The problem with this sort of team would be their lack of knowledge concerning the job which they are evaluating.

The formation of an independent external evaluation team is a valuable part of the ISD concept. A study should be conducted immediately to determine how an effective and efficient evaluation team can be formed.

2. <u>Procedure</u>

The procedures for conducting external evaluation in accordance with the IPISD Model, Figure 5.2, are divided into three major sections: planning evaluation, collecting data, and consolidating the data and making recommendations. These three sections will be covered in detail.

a. Plan Evaluation

Planning evaluation is a process that is to be completed prior to beginning an external evaluation. During this process decisions are made to determine how the evaluation will be conducted by addressing four questions: who will provide data, what data is needed, exactly when the external evaluation will take place, and what methods will be used to gather the data? Since planning the evaluation is such an important part of the quality control concept, these four questions will be covered separately.

(1) <u>Determine Who Will Provide the Data</u>. The IPISD Model specifies that in most cases data gathered for analysis will come from five major sources:

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(1)   Baseline data gathered prior to the development of instruction (see Figure 5.1, block II.2).

(2)   On-the-job course graduates.

(3)   Supervisors of on-the-job course graduates.

(4)   Evaluation team members (ideally composed of command and school personnel).

(5)   Records documenting students' performance during instruction.

Additionally, a check should be made on students who are not assigned to the job for which they are trained. Find out if they were initially assigned to that job and why they have been reassigned.

Discussion: The QCP specifies that data will be collected from both course graduates and supervisors of course graduates. However, the plan doesn't address utilizing data from the baseline study, evaluation team members, or records of students' performance. These three sources of information can provide invaluable information during external evaluation. Baseline data becomes a necessity if the technique of job performance evaluation is to be utilized to assess graduates' on-the-job performance, and evaluation team members' input data is extremely important no matter what technique is used to evaluate a graduate's ability to perform on the job.

The construction of the P-3 Instructional System is such that records of students' performance during instruction are available for use in evaluation. This sort

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of data becomes especially important when the other sources of data provide conflicting conclusions.

Recommendations: The QCP should state specifically and completely who will provide the data needed for evaluation. The author feels that the IPISD Model provides complete coverage of who will provide data. Therefore, the QPC would do well to adopt the data collecting procedures specified by the IPISD Model.

(2) Determine What Data Are Required. The IPISD Model suggests that data gathered from graduates, supervisors of graduates, evaluation teams, and students' records be compared to the baseline data to obtain at least partial answers to questions such as:

(1) Do graduates of the current training program show better performance on-the-job than graduates of past programs?

(2) Do graduates of the current training program require less on-the-job training than graduates of other courses?

Additionally, the IPISD Model states that the data gathered from the four sources should be directed toward answering specific questions. The data gathered from graduates who are working on-the-job should provide answers to such questions as:

(1) How well are they performing on the job?

(2) What is the extent of training received since their arrival on-the-job?

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(3) How well did the course prepare them for the job?

(4) What parts of the training program were relevant and irrelevant to the job?

(5) In doing the job, how often do they use the skills taught?

(6) In doing the job, what tasks do they find the most difficult?

(7) In doing the job, for which tasks do they feel the least adequately prepared?

(8) In doing the job, which tasks do they feel they perform the best?

(9) How do they think the training program could be changed to better prepare them for the job?

From supervisors of the working graduates, get answers to such questions as:

(1) How well are the graduates performing on-the-job?

(2) How do the graduates compare to graduates of other courses, or those who received no training?

(3) What type and how much on-the-job training have the graduates received?

(4) In what areas are the graduates most adequately and inadequately prepared?

(5) In what ways could the training program be improved?

(6) Has the graduate had any problems operating equipment?

(7) Has the graduate's performance been well above or well below the level expected?

(8) Has the graduate been promoted or recommended for promotion?

The evaluation team should attempt to get answers to such questions as:

(1) Did the graduate score well on the job performance measures?

(2) Did the graduate fail any of the job performance measures?

(3) How close do the job performance measures fit the actual job requirements?

(4) Were guidelines followed to ensure that performance tests were properly administered and scored?

(5) Is the job in question structured in accordance with regulations or approved doctrine?

(6) Does the supervisor have satisfactory knowledge of the job?

(7) Is any other information available that should be considered in making revision decisions?

Discussion: Data gathering is the key element in ISD external evaluation. Therefore, any plan designed to conduct external evaluation must emphasize the collection of adequate amounts of data that are relevant to the questions for which answers are being sought. The IPISD Model states that ideally, external evaluation will be based principally upon actual job performance as measured by JPMs that were produced during the design of ISD Model. The model goes on to say that often because of difficulties some data will have to be collected in another way.

The P-3 Instructional System design concepts did not allow for the production of complete JPMs during its development. Therefore, a means to collect hard data for graduate on-the-job performance evaluation does not presently

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exist. This forces the QCP to rely primarily on questionnaires and interviews to gain the data necessary to answer the questions proposed above by the IPISD Model.

Recommendations: The abscence of JPMs in a military service ISD based training program is not unusual. The advanced techniques, time, and manpower required to construct these measures often cause them to be omitted during the training program development. Additionally, utilization of the JPMs to gain accurate performance data for evaluation might be extremely desirable, but it is usually so expensive that it is not feasible.

Well-designed questionnaires and properly conducted interviews are capable of producing a wealth of information. It is recommended that if it is not feasible to construct JPMs at the present time, the QCP be structured to make optimum use of these alternate data gathering tools. Also provisions should be made to allow the restructuring of the IPISD model proposed questions that deal with JPMs.

(3) Determine When External Evaluation Will Take Place. Generally speaking, a course graduate should be given at least 30 days on the job before he is contacted. This period of time will allow him to become accustomed to his new job and will give his supervisor enough time to observe him and provide a useful evaluation of his performance.

Do not allow more than 90 days to pass before contacting the graduate and his supervisor. Exceeding this length of time will make it difficult for the graduate to remember the particulars of his instruction and how well it prepared him for the job. Also, it will hamper the supervisor's ability to recall how well the graduate performed during the first few weeks on the job.

Discussion: The QCP specifies that interviews be conducted with initial course graduates and their supervisors approximately six months after the graduate begins his operational assignment. The plan also requires that questionnaires be distributed and retrieved, but gives no timeframe for this to be accomplished. The author assumes that the questionnaires were to be distributed during the same timeframe that the interviews were conducted (i.e., approximately six months after the graduate begins his job). Furthermore, since the plan only addresses interview times for initial course graduates, one must assume that the same relative timeframe would apply to graduates on a continuous basis. The general assumption that is being made is that the QCP, as it now stands, calls for external evaluation to take place approximately six months after a graduate begins his job in the fleet.

The six-month wait, before administering external evaluation as required by the QCP, certainly satisfies the IPISD Model's minimum delay of 30 days. This delay allows the graduate time to get comfortable in the job and gives the supervisor a reasonable amount of time to observe him. On the other hand, the six-month wait far exceeds the IPISD Model's recommendation for a maximum delay of three months. This excessive delay would certainly make it difficult for the graduate to recall details of his instruction and for his supervisor to pinpoint the graduates' initial capabilities. Additionally, the author feels that a six-month delay would impose a severe bias on the evaluation due to the strong influence of squadron training programs. During the author's three years in a VP fleet squadron, it was noted that except for rare instances, squadron training for a particular job began immediately upon assuming the duties of that job. Thus, after a six-month wait, a graduate's performance on the job would be clouded by six months of intensive squadron training.

Recommendations: External evaluation should be scheduled to take place during a timeframe that will minimize the degradations referred to in the discussion. Based upon the above information, it is suggested that the QCP adopt the IPISD Model's recommendation of conducting external evaluation between 30 days and 90 days after a

graduate reports to his fleet job. Due to the time normally required for one to become "settled" into a new job, the optimum timeframe for the evaluation would probably be 60-90 days after the graduate begins his job.

(4) Determine How the Data Will be Gathered

The three primary methods of gathering external evaluation data are:

(1) Through job performance measures.

(2) Through questionnaires.

(3) Through personal interviews.

The basic procedure is to provide questionnaires to the maximum number of graduates and their supervisors and to pick a random sample of graduates and their supervisors in the field for personal interviews. When a job performance evaluation is possible, it is usually subject matter/evaluation experts who collect data from job performance measures and actual observation of the graduate on the job.

Discussion: The QCP provides for external evaluation data to be gathered by questionnaires and personal interviews, which are two of the three methods mentioned in the IPISD Model. However, the QCP does not address data gathering via job performance measures, because as stated earlier, complete job performance measures were not constructed during the development of the P-3 Instructional System.

Specific procedures for determining how external evaluation data will be gathered are not covered in the QCP. Basically, the plan specifies that questionnaires will be sent to all initial course graduates and their supervisors and that personal interviews will be conducted at sites selected by the Navy. The P-3 Instructional System Management Plan makes additional provisions to provide questionnaires to all graduates which then makes the QCP process basically the same as the IPISD Model.

The IPISD Model suggests that a random sample of graduates and their supervisors be picked for interviews. The QCP, as it presently exists, leaves this process up to the Navy. To maintain the least amount of bias and ensure an accurate sample population, an expert should probably be consulted to aid in selecting the sample.

Recommendations: The QCP should be structured to provide questionnaires to all course graduates. Additionally, the system should include measures ensuring a high return rate for the questionnaires. Procedures for selection of a sample population to be interviewed should be devised by experts and structured such that Navy evaluation personnel could carry out the procedures on a continuous basis.

b. Collect Data

Once a detailed external evaluation plan has been completed, procedures for gathering data become relatively straight forward. The actual data collection falls into five major categories: (1) baseline data, (2) job performance evaluation data, (3) questionnaire data, (4) personal interview data, and (5) records of students' performance while enrolled in the training program. The procedures for data collection in each category are detailed below.

(1) <u>Collect Baseline Date</u>. The recommended collection of baseline data takes place in Block II.2 as shown in Figure 5.1. The data is used both to confirm the need for the development of new instruction and for use in conducting external evaluation of the new instruction. To fulfill its purpose, the baseline study must satisfy three basic requirements. First, the data gathering devices (JPMs, etc.), must gather valid and reliable information. Second, if JPMS are administered, the sample group must be representative of the population to whom the results will apply. Third, to ensure accurate data gathering, the sample group must not be substantially different from the group involved in the external evaluation.

Selecting an accurate sample population is fairly complex and possibly should be left to experts. The IPISD Model should be consulted for additional

recommendations and guidelines on selecting sample sizes and sampling procedures, etc.

Discussion: The IPISD Model relies on the utilization of previously constructed JPMs to perform its baseline study. The results of this study may then be used as data in the external evaluation process. Earlier in this section it was pointed out that due to a difference in design techniques, the development of the P-3 Instructional System did not include the construction of complete job performance measures. Therefore, at the present time, a baseline study for the P-3 Instructional System, based upon JPMs does not and cannot exist.

Recommendations: Baseline data plays a key role in external evaluation. The data producing study, if conducted properly, provides a standard to which the other sources of data may be compared. The ability to make this comparison provides a stable tool which tends to improve the worth of the evaluation. Therefore, it is recommended that steps be taken to determine what data exists within the P-3 Instructional System that could be used in a baseline study. Measures should then be taken to produce formal baseline data suitable for use in external evaluation. The study should adhere to the sample population selection procedures discussed in the IPISD Model, and should contain background

data similar to that required in the ANALYZE JOB Block of the IPISD Model.

(2) <u>Collect Job Performance Evaluation Data</u>. Block I.3 of the IPISD Model (Figure 5.1) states that there must be some kind of JPM developed for every task selected for training. Without these valid JPMs, there will be no hard data (i.e., no direct measure) of graduates' performance. Non-utilization of JPMs bases the external evaluation on interviews and impressionistic kinds of data which make decisions far riskier than those connected with JPMs.

Soundly constructed JPMs can often be used to overcome the constraints of time, equipment, facility availability, and cost encountered in actual observation of graduates on-the-job, for external evaluation. When these constraints make it impractical to evaluate the actual performance of the tasks for which the graduates were trained, the evaluation can be based on the JPMs. Additionally, utilizing JPMs for evaluation allows them to be compared to the actual job requirements, thus allowing their revisions, when necessary, to ensure successful job performance.

Discussion: The IPISD Model relies heavily upon JPM to provide a means of directly measuring a graduate's on-the-job performance. There is little doubt

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that well constructed JPMs provide the optimum tool for data comparison, baseline studies, and even performance evaluation when actual observation of the graduate doing his job is not practical. The lack of adequately constructed JPMs for each task in the P-3 Instructional System make their use for conducting evaluation impossible at the present time. According to a P-3-Instructional System Evaluation Study conducted by Pacer Systems, Inc. for the Naval Training and Equipment Center [Ref. 19], instructional system job performance measures are "Inadequately stated or not appropriate to tasks, or non-existent".

To overcome the problem of inadequate and non-existent JPMs within the P-3 Instructional System, one of two possible steps must be taken. First, solidly constructed JPMs can be provided, or second, the QCP can rely upon the so-called "riskier" methods of gathering data for external evaluation.

Recommendations: An immediate study should be conducted by qualified personnel to determine the exact status of JPMs in the P-3 Instructional System. The study should focus upon the cost and time to provide adequate JPMs for each task selected for training within the system. The results of the study should then be compared to possible use of alternative methods of data gathering, such as questionnaires and personal interviews. The comparison should

concentrate on such areas as cost, shortest time to incorporate, accuracy of data, and long-term effectiveness of the data-gathering devices.

(3) <u>Collect Questionnaire Data</u>. Although mailed questionnaires are not the most reliable method of gathering data from graduates and their supervisors, they are the least expensive. Meticulous attention to detail is required in questionnaire construction and utilization to ensure that sufficient quantities of accurate data are received for evaluation. When constructing the questionnaires, a few general rules should be kept in mind: (1) ask specific questions, (2) list the tasks the graduate was trained to perform in the main body of the questionnaire, and (3) supply open-ended questions asking for suggestions on improving the training program.

A large sample is required to provide accurate data. Therefore, a total population sampling is desirable to help ensure a large enough return rate to overcome variations in job requirements and erratic behavior of respondents.

Discussion: The QCP states that questionnaires are to be sent to all course graduates and their on-the-job supervisors. Sample questionnaires designed for this purpose are contained in Appendix A for the course graduate, and in Appendix C for his supervisor.

Recommendations: Properly constructed questionnaires utilized in a well-managed distribution and retrieval program can be instrumental in gathering accurate evaluation data in large quantities. Should the P-3 Instructional System management personnel make the decision to use alternate data gathering methods instead of JPMs for their primary data collection tools, the quality and management plan for questionnaires will become critical. Therefore, it is recommended that the presently existing QCP sample questionnaires be reviewed for construction accuracy and proper content. A questionnaire should then be devised for each aircrew position covered by the P-3 Instructional System.

(4) Collect Personal Interview Data. Specialists from the quality control team who are familiar with how the graduate was trained, are usually best suited to interview the graduate and his supervisor. Separate interviews with the selected sample populations of graduates and their supervisors should be structured to provide data on graduate assignments, utilization, and work proficiency. If necessary, telephone interviews may be used.

The interviews should consist of pre-planned lists of questions, such as those covered earlier in this section, used for the primary purpose of determining the graduate's proficiency. Also the interview should consider

how the graduates' skills are being utilized and how well the graduate is handling additional training. The structure of the interview should be kept flexible enough to fit the responses obtained from the person being interviewed.

Discussion: Earlier in this section it was mentioned that the QCP provides for on-site interviews with course graduates and their on-the-job supervisors. Also the plan specifies that the sample to be interviewed should be selected by the Navy. The QCP does not provide any detailed procedures for selecting a sample population or for preparing and conducting interviews.

The most useful information is usually obtained from an interview that is planned and conducted by an expert in the field. The interviewer should not only be well versed in interviewing techniques, but should also be familiar with the particular job held by the graduate he is interviewing.

Once again it should be pointed out that if P-3 Instructional System Management Personnel choose methods for data gathering other than JPMs, then information from interviews will play a significant role in the external evaluation process. Therefore, construction of the interview structure, and the manner in which it is presented, should be accomplished in the most optimum fashion allowable, within imposed constraints.

Recommendations: Prior to the implementation of the QCP, experts should be consulted to recommend a basic interview structure for each of the aircrew positions trained in the P-3 Instructional System. Additionally, training should be provided on interviewing techniques to those who will travel to the field to conduct the interviews. For example, the evaluation teams that were proposed in the introduction section of this chapter.

The selection of sample populations and sampling procedures, as mentioned earlier, should probably be left to personnel knowledgeable in that field. Otherwise, bias and inaccurately gathered data would no doubt degrade the value of information gained from the interviews.

(5) <u>Obtain Records of Students' Performance During Instruction</u>. Records of student's performance should be available to the external evaluator in case the other evaluation data indicate the students are not performing satisfactorilly on the job. This data supplies information such as: (1) students' scores on each lesson post-test, (2) passing criteria for each test, and (3) the number of tries the students required to pass each test. The construction of the performance data sheet also allows students' scores to be easily compared in an effort to locate unfavorable trends.

Discussion: The P-3 Instructional System Management Plan specifies that records of students'

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performance during training be maintained on "Student Test Score Transmittal Sheets". Shortly after implementation of their new ISD training program, VP-31 began utilizing a word processing system for data handling. This system has now replaced the "Student Test Score Transmittal Sheet" as a means of compiling and monitoring student's performance while under instruction. The word processor seems to be very efficient and accurate and should fit well into an external evaluation program.

Recommendation: The use of a word processor has the capability of dramatically reducing the administrative workload for ISD personnel. There seems to be no reason to prevent this system from being used as an integral part of an external evaluation plan. When the QCP is being completed, the word processing system should be checked to ensure that the proper data are being gathered, and that the data are being provided in a format that will be usable in the evaluation plan.

c. Consolidate Data and Make Recommendations

The consolidation of data into a usable format is covered in Block I.1 of the IPISD Model. Using this format, graduate questionnaire data, supervisor questionnaire data, graduate interview data, supervisor interview data and JPMs may be compiled separately. Evaluation can then be initiated

by asking some pertinent questions, and checking the blocks of data for answers.

Normally the first question to ask should be, can the job-holding graduate perform the tasks he was trained to perform at the planned level of proficiency? This question usually leads to other questions such as: exactly which tasks are not being properly performed, and what does the job performance evaluation say about these unsatisfactorilly performed tasks?

A few additional questions to ask are:

(1) Are the tasks identified in the original job analysis the same as those tasks the supervisors think are necessary to the job?

(2) Are there areas where the graduates can score well on the JPMs but can't do the actual task?

The above questions are provided to illustrate that there are no specific rules for evaluating data and making recommendations for change. Above all, common sense should be used when evaluating the data. If most graduates and supervisors are satisfied with the quality of the training program, very few, if any changes are usually necessary. On the other hand, if a significant number of the sample population feels that training quality is low in some area, review the data to find possible causes for the inadequacy. The IPISD Model should be consulted for several more general suggestions for evaluating data and correcting problems.

As a result of the above evaluation techniques, changes may be made to the instructional system and/or the job structure. As an example of how the process works, if external evaluation shows problems with the instructional program, one would then go to Block V.3 REVISE SYSTEM, of the IPISD Model, and make the necessary changes. Next internal and external evaluation would be conducted again to check for errors. Eventually the only program revisions that will be necessary are those resulting from changes in content and doctrine.

Once this point is reached, the effectiveness of the training program should be checked by once again seeking answers to the questions:

(1) Do graduates of the current training program show better performance on the job than graduates of past programs?

(2) Do graduates of the current training program require less on-the-job training than graduates of other courses?

To answer the first question, a sample from the baseline study that is as similar as possible to graduates of the instruction being evaluated is selected. The two groups are then compared on their performance on the JPMs. If the performance level of the two groups is close (say 75 verses 85 percent) experts should construct and administer a statistical test to determine how often such a difference could be due to chance alone. The answer to the second

question can be obtained in a similar manner, but the data is gained from the questionnaires and interviews.

Discussion: Following the data gathering effort, of external evaluation, are the extremely important steps of data consolidation and analysis. Together, data gathering and data analysis provide the basic framework for the entire concept of conducting external evaluation. Therefore, it is only proper that optimum analysis of the data be provided after extensive efforts have been expended to gather the "correct" data.

Although the QCP does not specify adequate procedures for data consolidation and analysis, at the present time, it does provide some general guidelines. The plan places the responsibility for data analysis upon the Instructional System (IS) Department of VP-31. The basic process of data summarization and analysis within this department falls on the Subject Matter Experts (SMEs), for each aircrew position. The basics for the SMEs analysis is a comparison of fleet input data to other data (i.e., data from present students and instructors). The purpose of the analysis is to determine the performance of a graduate on-the-job, and to point out areas within the training program where the subject matter content is deficient. Once the SME has completed his analysis, he suggests corrective actions that will be considered by Training Officers/Course

Supervisors. Many of the problems which arise during analysis and revision attempts will be handled by a Curriculum Control Board (CCB), which is composed of representatives from the IS Department, FASO, VP-31 training office, etc. These procedures are not detailed enough to conduct an effective analysis, but they do seem to follow the basic recommendations of the IPISD Model.

Recommendations: Regardless of whether external evaluation of the P-3 Instructional System is conducted by an evaluation team, as suggested by the author, or by SMEs from the IS Department, detailed administrative and analysis procedures must be provided if the evaluation is to be successful. The procedures must be explicit enough to overcome the high job turnover rate of professional evaluation team members and SMEs, and must provide additional guidelines to compensate for non-professional evaluators (i.e., SMEs who have not been extensively trained in interviewing, data interpretation, etc.) if they are used instead of an evaluation team.

The process for completing the QCP should provide detailed procedures for questionnaire distribution, retrieval of all data, consolidation and analysis of data, and use of data for making instructional system revisions. The procedures must also take into account whether or not the use of JPMs have been employed in the evaluation. Several of

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these areas are addressed briefly in the IPISD Model, but much more detail must be provided if a realistic and accurate evaluation is expected to take place on a continuous basis.

3. Outputs

   a. Products

   The primary product of the evaluation process is an external evaluation report (EXER). This report is composed of a summary statement of all external evaluation procedures, findings, interpretations, and recommendations for revisions.

   b. Other Documentation

   This documentation includes supporting information such as:

   (1) A statement giving pertinent information about the graduate being evaluated.

   (2) The date evaluation took place, and the length of time between the completion of training and the conduction of external evaluation.

   (3) A statement describing how the evaluation was conducted.

   (4) A statement describing graduates' responses to questionnaires and interviews.

   (5) Job performance evaluation results.

   (6) How the evaluation team interpreted the data from items (3), (4) and (5) above.

   (7) Other information that influenced final recommendations.

   (8) Recommendation for revising the insructional system.

(9) Recommendations for revising the job structure.

(10) General rcommendations not covered above.

Discussion: Since the QCP has not been completed, it does not address the external evaluation report and its supporting information. However, the plan does recognize the need for such documentation, in that it discusses such products as a Revision Specification Worksheet and the necessity for course revisions.

Recommendations: The IPISD Model seems to provide a complete list of external evaluation outputs. It is recommended that QCP designers refer to the IPISD Model for suggestions in completing this phase of the external evaluation plan.

B. FEASIBILITY OF INCORPORATING THE P-3 INSTRUCTIONAL SYSTEM EXTERNAL QUALITY CONTROL PLAN

The ISD based P-3 Instructional System was implemented at VP-31 approximately three and one-half years ago. Since that time IS Department management and instructional personnel have succeeded in correcting almost all of the design errors and implementation problems associated with the new program. These corrections along with a series of continuous material and procedural improvements have allowed the system to evolve into a state of extreme stability.

The stable condition of the P-3 Instructional System plus the improved abilities of its managers and instructors, since implementation, suggest the present time as being favorable for incorporation of the evaluation phase of the program. This important step would provide the VP FRSs the "closed-loop" training system they initially sought to replace the traditional system. Since this thesis focuses on external evaluation, this discussion will be limited to that part of instructional system design and operation.

Although this appears to be an opportune time to complete and incorporate the QCP, several obstacles exist that must be overcome or at least circumvented. One of the obstacles hindering successful implementation and operation of the QCP is the lack of enough adequately trained personnel to act as evaluators/administrators. No matter which evaluation concept is adopted (i.e., using an evaluation team or existing IS Department personnel for evaluators), there are not enough suitable personnel presently available to adequately do the job. This problem seems to have the highest probability of being solved by adopting the team concept. For example, an instructional design/evaluation expert could be hired on a permanent basis to provide team stability. The team members could then be obtained in the following manner. An individual is placed within the FRS as an SME/track manager for approximately one and one-half

years. Following this time period, he is then rotated to the external evaluation team for one and one-half years. This method would provide a knowledgeable individual, for every aircrew position, to act as an external evaluator. The instructional design/evaluation expert and turn-over notebooks would be available to bring the newly installed evaluators "up-to-speed" on all procedures that deal with evaluation such as interviewing techniques, data analysis, etc. This suggestion for forming an evaluation team is based on the premise that experts have been hired to totally complete and aid in the initial implementation of the QCP. This concept could be duplicated if necessary to provide a complete team for each FRS. Depending upon the actual workload involved, the teams could possibly assist in conducting internal evaluation for the training system. This suggestion for an independent evaluation team could possibly eliminate the shortage of suitably trained personnel to conduct external evaluation.

A second obstacle that must be faced in establishing a fully functional QCP is inadequate funding. With today's "hard-times" economic situation, getting funding for anything short of an emergency situation is next to impossible. Yet, one must consider the benefits to be gained from a fully-implemented state-of-the-art training system (i.e., continuous assurance that the training program is optimally

effective and cost efficient). The actual cost for completion and implementation of the QCP appears to be very small when compared to the resultant benefits of such a plan. Perhaps consideration should be given to the IPISD Model statement [Ref. 8] that implementation is an evolutionary process. It might be feasible to start out conducting partial external evaluation and work up to a full-fledged program after some period of time. According to the IPISD Model [Ref. 8], "...the spirit of the procedure is far more important than the letter".

A third obstacle that must be overcome is an inadequate management plan. The existing management plan was designed for use without a complete QCP incorporated. The IPISD Model stresses the necessity of matching the management plan and the delivery system to lower internal costs. This applies to the evaluation process as well as the rest of the system. Therefore, the P-3 Instructional System Management Plan must be revised when a complete QCP is incorporated.

The fourth and final area that will be addressed concerning incorporation of the QCP is the need for improved data handling capabilities. Once the FRSs begin conducting external evaluation, the IS Department must have a means to store and utilize the additionally generated data. The solution to this problem could possibly be the Aviation Training Support System (ATSS) which is already partially in

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existence at VP-31's IS Department.   Presently,   the ATSS is
incomplete and the existing software is very weak.   However,
it appears that acquiring the components to complete the
system,   and designing necessary software to handle the new
demands imposed by the incorporation of the QCP could be both
possible and practical.

VI.   DISCUSSION AND SUMMARY OF RECOMMENDATIONS

The P-3 Instructional System appears to be a well-constructed and expertly managed training program that produces a quality graduate who is thoroughly capable of doing his job in the fleet. The problem that exists is to prove this statement. Without a viable external evaluation plan, it is almost impossible to determine if the P-3 Instructional System is superior to the traditional training program that it replaced and if the system is in fact producing the high caliber graduate needed to operate and maintain the sophisticated equipment on the P-3 aircraft.

The intentions of this thesis have been to examine the status of the P-3 Instructional System External Quality Control Plan and to provide recommendations for its completion and incorporation. The purpose for the examination of the Plan was to aid in the improvement of the instructional system and the quality of its graduates. The author realizes, as stated earlier, that the external evaluation plan cannot actually be thought of as a single unit of the instructional system, but must be viewed as an integral part of the entire system. This idea was kept in mind during the analysis of the plan.

During the interim of this report, it was pointed out that due to certain unavoidable constraints, the external quality control plan was never completed. Although this fact is true, it is the author's opinion that Courseware, Inc. has provided a reasonably good start on the framework of the plan when compared to the IPISD Model. Additionally, the author believes that, due to the extreme importance of external evaluation and the long period of time that the Instructional System has been allowed to operate without it, experts should be employed immediately to complete the plan and aid in its incorporation. There is little doubt that this plan would more than pay for itself in the long run.

During the analysis of the QCP, it was noted that neither ISD model provided detailed procedures for conducting external evaluation. The IPISD Model stated that this lack of detail was intentional and would allow each command to fit the model to its own particular instructional situation. This approach is probably a good idea, but the author strongly believes that the details for evaluation should be provided by experts and not Naval personnel who are unfamiliar with instructional design and evaluation. It is recommended that experts provide all procedural detail (i.e., general evaluation concepts, data collection, interviewing procedures, data analysis, etc.) and aid in the incorporation of the plan before turning the program over to the VP-31 IS

Department. This will provide a solid foundation for the
evaluation and should minimize errors in design concepts and
operating procedures.   It should also be experts that decide
whether it is feasible to construct and use JPMs for
evaluation data, or whether the evaluation should be based on
other data, such as questionnaires and interviews.

Instructional Systems Development External Evaluation is
a precise and time-consuming endeavor.   Since it is a
possibility that completion and incorporation of the QCP may
not be feasible at the present time,   two alternative
evaluation methods will be mentioned for   consideration.
First, Scriven [Ref. 20] proposed evaluation procedures whose
purpose is based on "goal-free evaluation".   In other words,
the evaluation examines the effects of an   educational
innovation and assesses the worth of the effects, whatever
they are. With this method, the evaluator is not confined to
the stated objectives, but is free to assess and evaluate
outcomes of any sort.   This method is complex, but allows
systematic judgment of appropriateness and general worth of
the instructional product.   The major emphasis of the model
is verified performance.

Second,   Stufflebeam [Ref.   21] developed evaluation
methods composed of a model called CIPP (Context, Input,
Process, and Product).   The model considers evaluation as a

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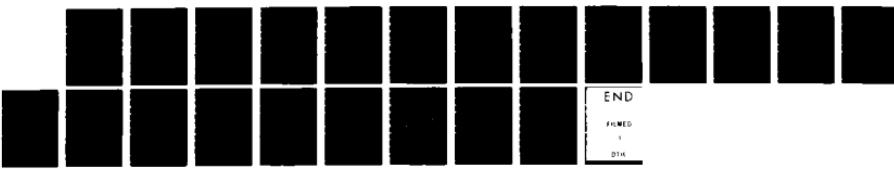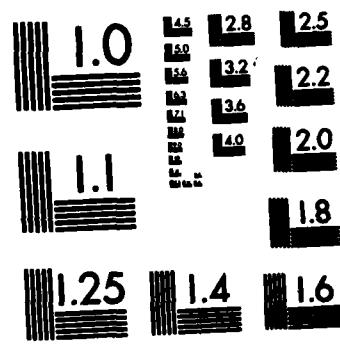
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continuous process whose purpose is to guide decision making. The major emphasis of the model is on continuous planning.

Although the two evaluation models just discussed are widely accepted in the field of instructional program design, the author feels that, if at all possible, the P-3 Instructional System should contain an incorporated evaluation plan that forms a closed-loop system. Using anything less than pure ISD techniques for evaluation would probably be a step backwards for the training system.

The following recommendations for completing and incorporating the QCP are considered to be important:

-- A team capable of providing continuous external evaluation of the P-3 Instructional System should be formed. Optimally the team should not be connected to the training program.

-- A study should be conducted to determine whether the primary data source for the external evaluation should be based on job performance measures or alternate methods such as questionnaires and interviews.

-- The QCP should require external evaluation to be conducted 30 to 90 days after a graduate reports to his job, as recommended by the IPISD Model.

-- A study should be conducted to develop baseline data to be used as a standard for comparison in the external evaluation.

-- The currently existing QCP sample questionnaire for graduates and their on-the-job supervisors should be reviewed for accuracy of construction and content. A questionnaire, for each aircrew position trained, should be developed based on the updated sample.

-- Detailed interviewing procedures and correct and accurate methods for selecting sample populations should be provided by experts.

-- Generally speaking, procedures for the entire evaluation process consisting of planning, data gathering, data analysis, and recommending revisions should be provided by experts. This provision will give the evaluation effort a solid foundation and prevent evaluation errors.

-- The P-3 Instructional System Management Plan should be updated to deliver the new QCP.

-- A study should be conducted to determine if the Aviation Training Support Systems (ATSS) is capable of handling the data generated by conducting external evaluation.

The ISD based P-3 Instructional System represents a major step forward toward the application of "state-of-the-art" instructional design concepts. Continued refinement and an improved understanding of the ISD process should improve the instructional system by ensuring optimal training effectiveness, time efficiency and cost.

APPENDIX A

INITIAL COURSE GRADUATE FOLLOW-UP QUESTIONNAIRE
(Ref. 17: p. 159)

You are being asked to participate in the evaluation of the P-3 ISD training program. Please contribute your honest views on the training you received prior to your current assignment. All feedback will be considered in specifying revisions to the instructional materials. Your help is necessary for improving the training program for future students.

Please complete the following information. All questionnaire responses will be considered confidential.

Name _____

Rank _____

Current Job Title _____

Supervisor's Name _____

Graduate of P-3 ISD Course Location _____

Class No. _____

1. How long have you been working at your present job? (Circle one)

   a. 1 month

   b. 2 months

   c. 3-4 months

   d. 5-6 months

2. How well do you feel you are able to perform your present job?

   a. Above average

   b. Average

   c. Below average

3. Have you received any on-the-job training for your present job since you arrived?

   a. Yes

   b. No

   If yes, please specify:

   How much? _____

   _____

   What kind? _____

   _____

4. How well did the P-3 ISD training you received prepare you for your present job? (Circle one)

   a. More than adequate

   b. Adequate

   c. Inadequate

   d. Poor preparation

5. Were portions of the instruction irrelevant to your present job?

   a. Yes

   b. No

   Please specify: _____

   _____

   _____

6. In your present job, how often do you use the skills taught in P-3 ISD?

   a. Frequently

   b. Occasionally

   c. Not at all

Please specify if "not at all": _____

_____

_____

7. In your present job, what tasks have given you the most difficulty?

   Please specify: _____

   _____

   _____

6. What parts of the instruction do you think could be improved or added to better prepare future students for the job?

   Please specify: _____

   _____

   _____

9. Other comments: _____

   _____

   _____

APPENDIX B

INSTRUCTIONAL SYSTEMS SURVEY
PILOT STUDENT
(Ref. 18: p. H-26)

Within the last six months you completed P-3 FRS training. You should have now had an opportunity to apply this training as a member of a flight crew. We would like you to think back to the training you received at the FRS and complete the attached questionnaire. The results of these questionnaires will be used to improve the training program for future students. Thank you for your cooperation in completing and returning this questionnaire within three weeks in the envelope provided. Your answers are IMPORTANT.

INITIAL COURSE GRADUATE FOLLOW-UP QUESTIONNAIRE

Name _____

Rank/Rate _____

Aircrew Position/Designation _____

Supervisor's Name _____

Graduate of P-3 FRS Course Location _____

Class No. _____

You are being asked to participate in the evaluation of the P-3 FRS training program. Please contribute your honest views on the FRS training you received prior to your current assignment. Your help is necessary for improving the training program for future students.

Please complete the following information. All questionnaire responses will be considered confidential.

1. How long have you been assigned to your present crew position?

    a. 1 month
    b. 2 months
    c. 3-4 months
    d. 5-6 months

2. How well did the P-3 FRS training you received prepare you for your present aircrew assignment?

    a. More than adequate
    b. Adequate
    c. Inadequate

    If you answered c, please specify which areas: _____

    _____

    _____

3. Do you use the majority of the skills learned in the P-3 FRS course on your present aircrew position?

a. Frequently
b. Occasionally
c. Not at all

Please specify those you do not use: _____

_____

_____

4. In your present aircrew position, what tasks have given you the most difficulty? (Please specify): _____

_____

_____

5. After having been on-the-job for a few months, which of the following subject areas covered in P-3 FRS training would you like to see improved? ( )

a. _____ Systems
b. _____ Normal Procedures
c. _____ Performance
d. _____ Emergency Procedures
e. _____ Instrument Procedures
f. _____ Safety/Survival/Landing Procedures
g. _____ Navigation
h. _____ Oceanography
i. _____ Search Tactics
j. _____ Localization Tactics
k. _____ Introduction to SS-3 (RADAR, ESM, IRDS, MAD)
l. _____ Active Tactics
m. _____ Search/Kill Stores
n. _____ Plot Stabilization
o. _____ Communications
p. _____ Secondary Missions (Mining, SAR, Rigging, SOSUS, Soviet Naval Threat, RECCO, Coordinated Operations)

Please specify the improvements you recommend: _____

_____

_____

6. Which of the following performance situations in the P-3 FRS training would you like to see improved? ( )

Device Sessions

a. _____ Cockpit Procedural Trainers (CPT-Normal and Emergency Procedures)
b. _____ Flight Simulators (2F87-Normal and Emergency Procedures)
c. _____ Aircraft Labs (Preflight/Postflight)

Flights

a. _____ Fly Phase (I-V)
b. _____ NAV Phase (I and NAV Extended)
c. _____ TAC Phase (I-IV)

Please specify the improvements you recommend: _____

_____

_____

7. Other comments: _____

_____

_____

JOB SUPERVISOR FOLLOW-UP QUESTIONNAIRE
(Ref. 17: p. 163)

You are being asked to participate in the evaluation of the P-3 ISD training program. Please contribute to this effort by evaluating the job performance of P-3 ISD initial course graduates. All feedback will be considered in specifying revisions to the instructional materials. Your help is necessary to improve the training for future course graduates.

Please complete the following information. All questionnaire responses will be considered confidential.

Name _____

Rank _____

Job Title _____

P-3 Course Graduates Supervised:

Names: _____

_____

_____

1. How long have you supervised the P-3 ISD initial course graduate(s)? (Circle one)

    a. 1 month

    b. 2 months

    c. 3-4 months

    d. 5-6 months

2. How well are the graduates able to perform on the job?

    a. Above average

    b. Average

    c. Below average

3. Did the graduate(s) receive any additional on-the-job training after arrival to the squadron? (Circle one)

a. Yes

b. No

If yes, please specify:

How much? _____

_____

What kind? _____

_____

4. How do these graduates perform on the job as compared to those who were trained in the past?

a. Above average

b. Average

c. Below average

Please specify if below average: _____

_____

_____

5. In what task areas were the graduates inadequately prepared to perform on the job?

Please specify: _____

_____

_____

6. Has the graduate had accidents or been reprimanded for misuse or improper operation of equipment?

a. Accident(s)

b. Misuse of equipment

c. Improper operation of equipment

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Please specify: _____

_____

_____

7. Has the graduate been warned for unusually bad performance?

   a. Yes

   b. No

   Please specify: _____

   _____

   _____

8. Has the graduate been commended or recommended for promotion?

   a. Yes

   b. No

   c. Possible future consideration

9. Other comments: _____

   _____

   _____

APPENDIX D

INSTRUCTIONAL SYSTEMS SURVEY
PILOT SUPERVISOR
(Ref. 18: p. H-20)

You are currently supervising the recent FRS graduate whose name appears on the enclosed questionnaire. You should have had some opportunity to observe his performance as a flight crew member. We would like you to evaluate the graduate's performance by completing the questionnaire.   The results of these questionnaires will be used to improve the training program.   Thank you for your cooperation   in completing and returning this questionnaire within three weeks in the envelope provided. Your answers are IMPORTANT.

JOB SUPERVISOR FOLLOW-UP QUESTIONNAIRE

Name _____

Rank/Rate _____

Crew Position/Designation _____

P-3 FRS Course Name: _____

FRS Graduate Name: _____

You are being asked to participate in the evaluation of the P-3 FRS training program. Please contribute to this effort by evaluating the aircrew performance of P-3 FRS course graduates. Your help is necessary for improving the training program.

Please complete the following information. All questionnaire responses will be considered confidential.

1. How long have you supervised the FRS graduate names above? (Circle one)

   a. 1 month
   b. 2 months
   c. 3-4 months
   d. 5-6 months

2. How well is the graduate able to perform his aircrew duties? (Please consider the following criteria in answering this question): (Circle one)

   - Qualified = Tasks performed in accordance with NATOPS or other established standards.

   - Minor Errors = Tasks NOT performed in accordance with NATOPS or other established standards when the performance does not meet the criteria specified for major errors.

   - Major Errors = Tasks performed incorrectly AND which have the potential of:

1) Adversely affecting safety of flight or personnel.

2) Risking damage to equipment.

3) Jeopardizing mission accomplishment.

a. Qualified
b. Minor errors
c. Major errors

Please specify: _____

_____

_____

3. Did the graduate require any additional training for skills he should already have? (Circle one)

a. Yes
b. No

If yes, please specify: _____

_____

_____

4. Is the graduate making satisfactory progress towards designation as PP3P/PP2P/PPC?

a. Yes
b. No

Please specify: _____

_____

_____

5. Has the graduate had any accidents or incidents that were the result of personal error or been reprimanded for misuse or improper operation of equipment?

a. Accident(s) or incident(s)
b. Misuse of equipment
c. Improper operation of equipment

Please specify: _____

_____

_____

6. Has the graduate been warned for unusually deficient performance?

a. Yes
b. No

Please specify: _____

_____

_____

7. Has the graduate exhibited superior performance?

a. Yes

b. No

Please specify: _____

_____

_____

8. After having supervised the graduate "on-the-job" for a few months, in which of the following areas do you feel that this person requires more training? (   )

Ground School

a. _____ Systems
b. _____ Normal Procedures
c. _____ Performance
d. _____ Emergency Procedures
e. _____ Instrument Procedures
f. _____ Safety Survival/Landing Procedures
g. _____ Navigation
h. _____ Oceanography
i. _____ Search Tactics
j. _____ Localization Tactics
k. _____ Introduction to SS-3 (RADAR, ESM, IRDS, MAD)
l. _____ Active Tactics
m. _____ Search/Kill Stores
n. _____ Plot Stabilization

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o. _____ Communications
p. _____ Secondary Missions (Mining, SAR, Rigging, SOSUS, Soviet Naval Threat, RCCO, Coordinated Operations)

Device Sessions

a. _____ Cockpit Procedural Trainers (CPT-Normal and Emergency Procedures)
b. _____ Flight Simulators (2F87-Normal and Emergency Procedures)
c. _____ Aircraft Labs (Preflight/Postflight)

Flights

a. _____ Fly Phase (I-V)
b. _____ NAV Phase (I and NAV Extended)
c. _____ TAC Phase (I-IV)

Please specify the improvements you recommend: _____

_____

_____

9. Other comments: _____

_____

_____

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APPENDIX E

REVISION SPECIFICATION WORKSHEET
(Ref. 17: p. 75)

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